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CA

PROCEEDINGS AND PROPERTIES

Physicochemical investigation of the system aluminum-magnesium. E. M. S. Kurnakov and V. I. Mikhovskiy. *Ann. soviet acad. (phys. chem., fast. chem. gen.)* (U. S. S. R.) 10, 6-36(1966). D. The fusion diagram of the Al-Mg system. *Met.* 37-68. The equilibrium diagrams of the Al-Mg system were detd. by the methods of thermal analysis, microscopic and hardness exam., x-ray analysis and measurement of elec. potential and resistance. The combined results indicate the existence of 4 phases in the system: α (0-15% Mg), β (35.3-7.7% Mg), γ (41.5-50.4% Mg), and δ (50-100% Mg). Contrary to Hansen and Gayler (C. A. 14, 3212) and Gault (Z. anorg. Chem. 48, 224(1908)), the tentative graphic results disprove the existence of definite chem. compds. of Al_2Mg or AlMg for the β -phase and Al_2Mg or AlMg for the γ -phase. These 2 intermetallic phases form, probably, compds. of variable compn., which are not characterized by single points and do not contain chem. compds. (cf. Kurnakov, Zhuravskiy and Tatarin, *J. Russ. Phys.-Chem. Soc.* 38, 808(1906)). The existence of an independent phase, corresponding to the compd. AlMg by $\text{Al:Mg} = 1:1$, and the formation of the compd. AlMg by the peritectic reaction of the melt (Kawakami, C. A. 28, 6084) are refuted. Photomicrographs and references are given. Chas. Blanc

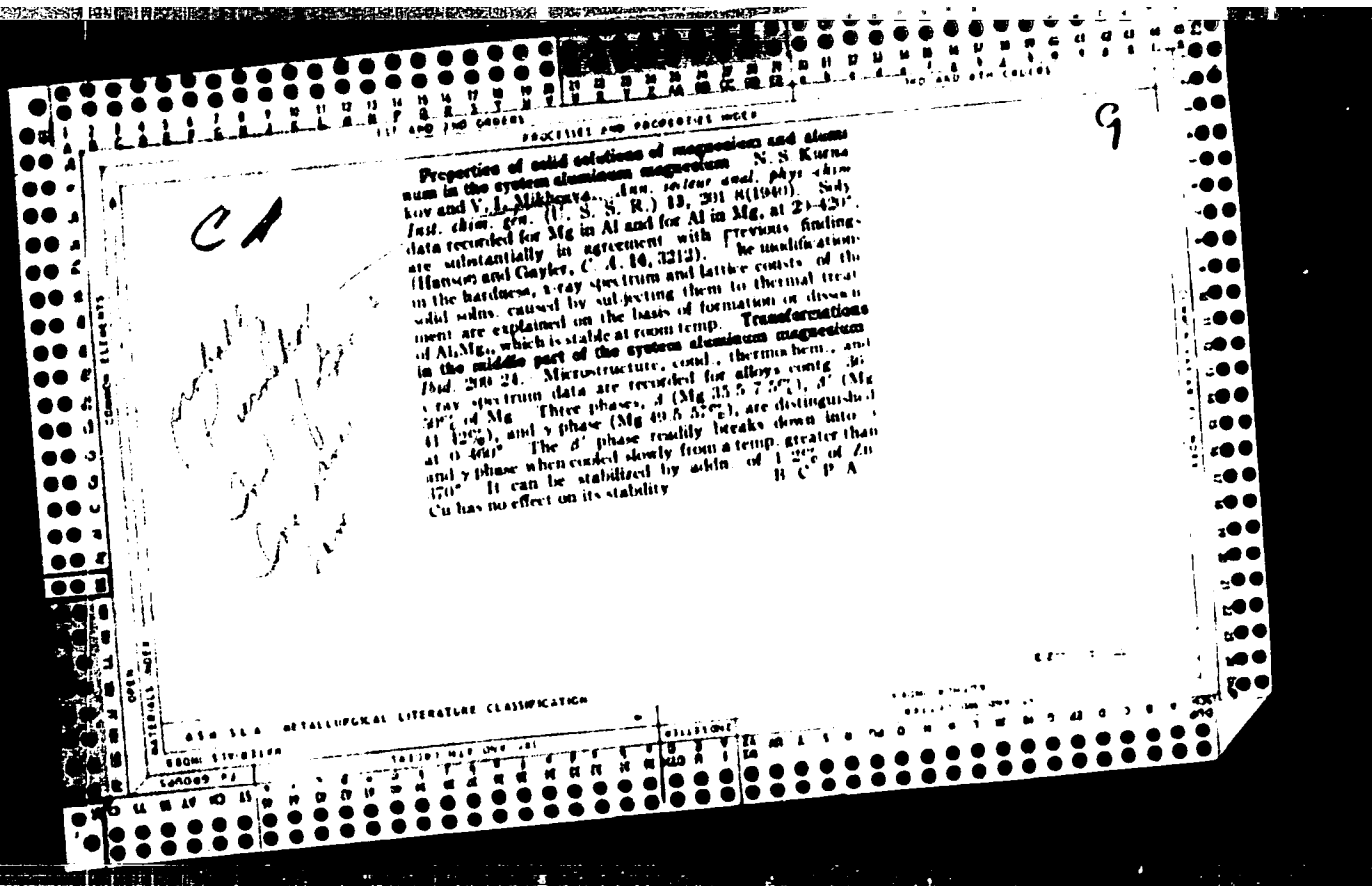
ASO-510 METALLURGICAL LITERATURE CLASSIFICATION

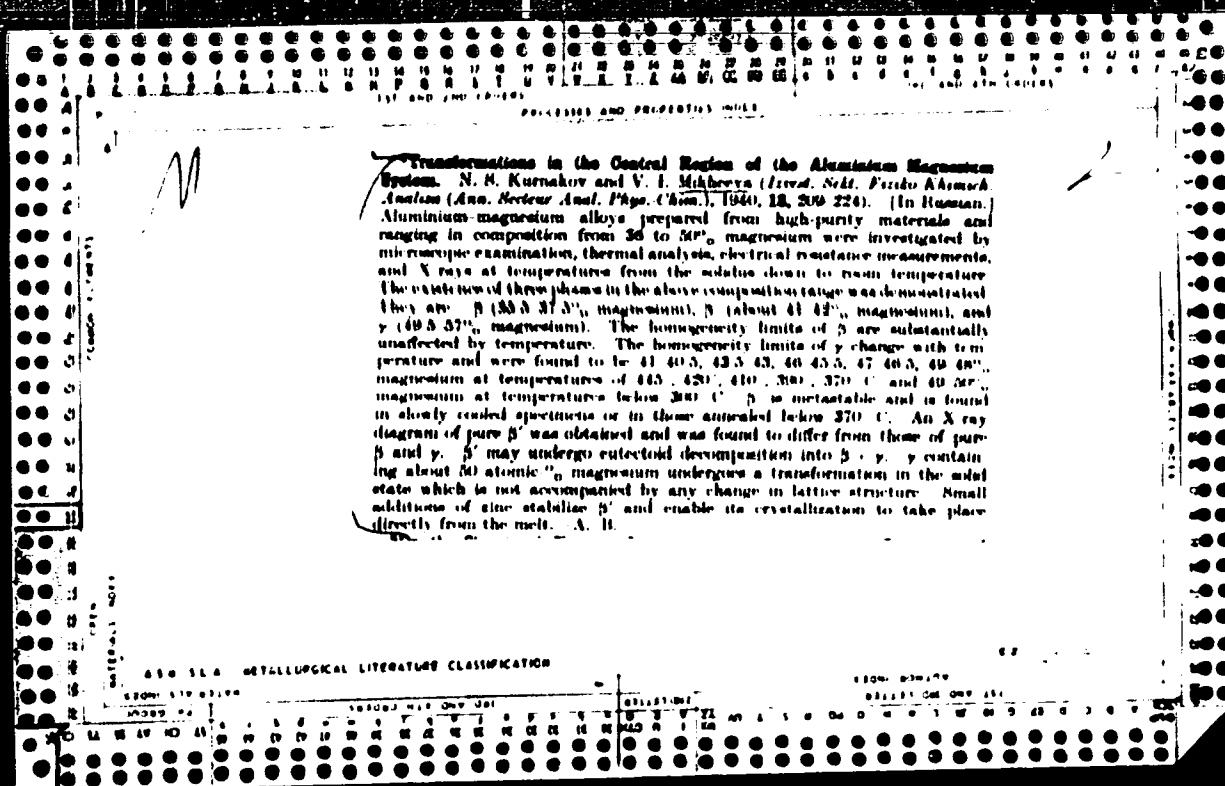
64-12

*The Solubility of Beryllium in Aluminum. V. I. Mikhreev (Sov. Acad. Sci. Bull. Acad. Sci. U.S.S.R., 1960, 43, 223, 752).
 [In Russian.] Aluminium beryllium hardeners were prepared by melting in an induction furnace under NaCl flux; loss of beryllium was as high as 30-40%. The alloys themselves were prepared by melting in an electric furnace under a carnallite-based flux; loss of beryllium was small. A special analytical method, based on the difference in solubility of double fluorides of aluminium and beryllium, was used to analyze the alloys. Alloys with up to 5% beryllium were prepared. Thermal analysis showed the existence of a eutectic arrest in the alloy containing 0.2% beryllium, the eutectic being found at 0.5% beryllium and 647°C. With more than 0.5% beryllium the temperature of the primary arrest rose rapidly, indicating primary separation of beryllium. The solubility of beryllium in aluminium was studied by quenching and by the use of microscopic examination, the Sachs X-ray method (change in lattice constant), and electrical conductivity measurements. From the results obtained by the different methods, the solid solubility of beryllium in aluminium is given as 0.035% at 630°, 0.013% at 600°, 0.005% at 500°C, and 0% at room temperature. These results are shown to agree well with those of thermodynamic analysis. The presence of even small amounts of beryllium was found to cause marked hardening on heating at 150°C alloys.

quenched from 630°C. The maximum increase in hardness (91.9% O beryllium for 120 hrs. at 160°C. The absolute hardness attained was not great; it increased from 27 to 51.9 Brinell. A.S.

2
 Equilibrium Diagram of the Ternary IRON-CHROMIUM-ALUMINIUM SYSTEM. PRELIMINARY
 COMMUNICATION) I. KORNILOV, V. MIKHAEVA, AND O. KONEVA PACHOVA (STALL, 1940,
 (5/8) 57-59; Bull. Iron Steel Inst., 1941, (69), 191, a) (In Russian)
 Alloys containing up to 49% aluminium and up to 100% chromium (impurities: carbon
 0.02-0.4, sulphur 0.06-0.1, phosphorus 0.005-0.006%) were studied along
 sections parallel to the iron-chromium and iron-aluminium systems, using the
 methods of thermal analysis, micro-examination and hardness and electrical-
 conductivity measurements. A melting point diagram has been constructed.
 The ternary solid solubility decreases with temperature; the electrical resistance
 of the ternary solid solution increases with concentration of chromium and alu-
 minium. Resistance to scaling also increases with aluminium content for a constant
 chromium content; it is affected, however, by homogeneity, being greater in
 homogeneous alloys. Thus alloys having chromium 15-25, aluminium 5-6% were
 more resistant to scaling than those with chromium 25-30, aluminium 5-6%.





MIKHEYEVA, V. I.

331/112(T 4396)

669.7.018

Effect of Cerium on the Properties
of Magnesium-Aluminium Alloys

Izv. Akad. Nauk, Otd.
Khim. Nauk
(6), 661-667
1941
U.S.S.R.

V. I. Mikheeva

The influence of small additions of cerium, manganese, and titanium on the micro-structure of magnesium-aluminium alloys is studied. As a result of the study of the respective phase diagrams, an explanation is given of the favourable effect of small additions of cerium on the diminution of the micro-structure of magnesium-aluminium alloys in the process of heat treatment. (Bibl. 11)

(TPA3/TIB Transl., (T 4396), 8pp., Oct., 1954)

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On Ternary Alloys of Magnesium with Aluminum and Cerium. N. A. Paganin and V. I. Mikhreeva (*Izv. Akad. Nauk SSSR, Ser. Fiziko-Khim. Anal. (Anal. N.S.S.R.)*, 1941, 14, 263-267).—[In Russian.] P. and M. investigated by thermal analysis and micro-examination, the constitution of the alloys lying within the triangle Al_2Mg_2 -magnesium- Al_2Ce . They also studied the age hardening properties of the alloys. The compositions of the diagram. There lay along six lines radiating from the magnesium corner of the diagram. There are five invariant points: (1) $Al_2Ce + a + Al_2Mg_2$ at 435° C.; (2) magnesium + Al_2Ce at ~575° C.; (3) $Al_2Ce + a + Al_2Ce$ at 561° C.; (4) magnesium + Al_2Ce at 625° C.; and (5) $Al_2Ce + a + CeMg_2$ at 588° C. A pseudo binary system exists between magnesium and Al_2Ce . This high melting point compound (~1405° C.) is the principal factor in determining the shape of the equilibrium model, and its presence has made difficult the establishment of equilibrium relations in the region of higher aluminum contents, where the crystallization interval is long and the temperature of final solidification low. The point solubility of aluminum and cerium in magnesium was determined at 540°, 500°, 420°, and 25° C. The solubility of cerium in magnesium falls on addition of aluminum; its maximum value is attained on the section magnesium- Al_2Ce . The solubility of cerium in magnesium-aluminum alloys is very small. Small additions of cerium up to 1.5% have little effect on the solubility of aluminum in magnesium. Additions of cerium up to 0.3% (in particular 0.1%) reduce the rate of age hardening of magnesium-aluminum alloys at 150° and 175° C. but, as would be expected from the small solubility of cerium, have no effect on the final hardness attained (85-97 Brinell). Alloys on the sections magnesium- Al_2Ce , magnesium- Al_2Ce , and magnesium- Al_2Ce do not age harden to any great extent, notwithstanding a considerable change in solid solubility with temperature. The paper is well illustrated with diagrams and photomicrographs. N. B. V.

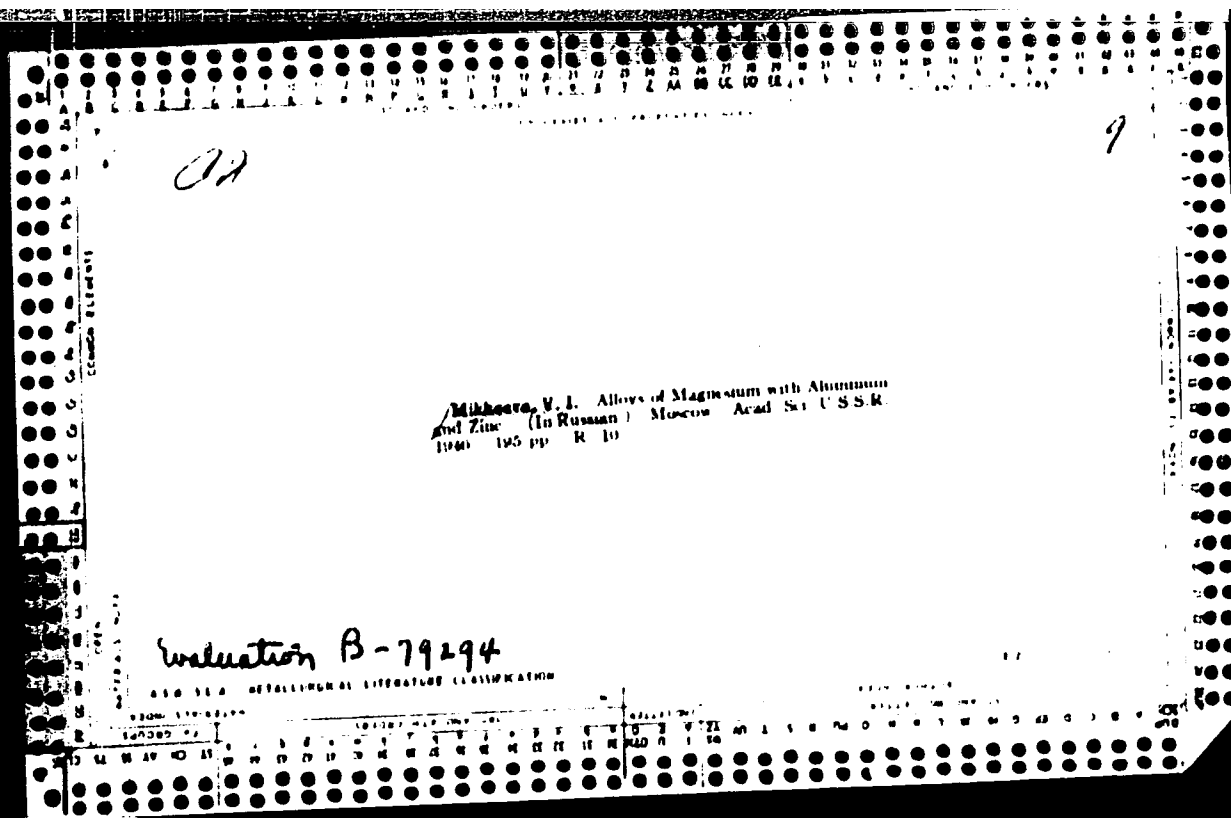
ON THE CHEMICAL NATURE OF THE INTERMETALLIC COMPOUND γ IN THE ALUMINIUM-MAGNESIUM-ZINC SYSTEM. V. I. MIKHKEVA AND O. N. HRYUKOVA (IZVEST. AKADEM. NAUK S.S.S.R., 1944 (Khim.), (5) 296-306) (In Russian) From the results obtained by thermal analysis, measurements of specific resistance and its temp. coeff., and microscopic examination of the ternary aluminium-magnesium-zinc alloys, M. and K. conclude that the γ -phase which appears in this system is an example of a ternary berthollide phase. Owing to its chemical nature, it dissociates with change of temp. At room temp it contains the unstable compound $Al_{1.5}Mg_2Zn_3$, which changes into a still less stable compound $Al_{1.5}Mg_3Zn_3$, just below the solidus temperature. Binary berthollide phases in the same system show a similar behaviour. VK

PROCESSES AND PROPERTIES INDEX

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on the Chemical Nature of Bertholides. V. I. Mikheyev (*Izv. Akad. Nauk S.S.S.R.*, 1944, [Khim.], (6), 396-405).—[In Russian.] M. considers that from recent researches on the binary and ternary alloy systems which show the presence of bertholide phases, the following main conclusions can be drawn: (1) bertholides are solid solutions of unstable compounds of heavy metals of the first long period, of metals of odd sub-groups of groups II-V, and of aluminium; (2) under the influence of equilibrium factors, viz., temp., pressure, and concentration, the valency state of metals forming bertholides changes, and dissociation of the compound takes place, so that the stability of bertholides extends over a range of temps. and concentrations; (3) binary bertholide phases can form ternary phases, and the existence of ternary inter-metallic phases is as a rule connected with the existence of binary bertholides. In view of the above properties, there exists a possibility of extending the field of age-hardening alloys to which bertholide phases confer useful properties. 37 references are given.—V. K.

ASD 514 METALLURGICAL LITERATURE CLASSIFICATION



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THE PHYSICOCHEMICAL ANALYSIS OF MAGNESIUM RICH MAGNESIUM ALUMINIUM CADMIUM ALLOYS. V. I. MIKHLEVA, V. P. VASIL'eva, AND O. N. KRYUKOVA (IZVEST SERT. FIZIKO KHIM ANAL., 1946, 18, (2) 276-294) (In Russian) The melting diagram of the magnesium-rich region of the system magnesium-aluminum-cadmium was determined by thermal and microstructural analysis, and the distribution of the phases at 395° and 20°C. is given. Equilibrium in solid solutions of the magnesium-cadmium system (see Janz's diagram, Z. Metallkunde, 1938, 30, 424; Met Abs., 1939, 6, 48) simultaneously with the γ -phase of the magnesium-aluminum system, and γ two ternary peritectic and a ternary eutectic between α_3 , γ , and α aluminum at approx. aluminum 14, cadmium 32, magnesium 54%, 396 \pm 0.5°C. The limits of all the phases taking part in the equilibria in the magnesium corner of the system (δ - and ϵ -phases of the magnesium-aluminum system and α_1 , α_2 , and α_3 -phases of the magnesium-cadmium system) were determined by the micro-examination of quenched specimens. These data were confirmed by measurements of the

458 51.4 METALLURGICAL LITERATURE CLASSIFICATION

electrical conductivity, its temp. coeff., hardness, and corrosion-resistance of the alloys. The work carried out shows that the construction of composition-property diagrams is a good way of studying the nature of binary phases to which a third element is added. Increase in cadmium content in the region of equilibrium between the α solid solution and the β -phase reduces the capacity of the alloys for age-hardening. It is shown that the boundary of chemical action (Tammann's resistance limits) for the solid solution of magnesium and cadmium does not correspond strictly to the 1:4 or 1:8 molecular proportions within the limits of the solid solution, but ~~is~~ is connected with the existence of a heterogeneous region. NA

^Y
MIKHEEVA, V. I.

[^]
Chemical properties of high-grade magnesium and zinc aluminum alloys. Mikhova, D.G.
131 p. (42-20111)

TN775.M57

MICHEEBA, V. I.

PA 9T53

USSR/Fusion
Alloys, Fusible

May 1947

"Polythermic Volume of Crystallization of a Hard
Mixture of Al-Mg-Zn," V. I. Micheeba, O. N. Kryukova,
3 pp

"Doklady Akademii Nauk SSSR" Vol LVI, No 5

Discussion and diagram of results from the study of
fusion of the subject alloys for varying composition.

9T53

MIKHEYEVA, V. I.

PA 5PT6

USSR/Chemistry - Alloys
Chemistry - Systems, Ternary

May 1947

"Application of the Law of Mass Action to the Analysis
of the Form of Elements Limiting Polythermal Volumes
in Ternary Systems," V. I. Mikheyeva, 2 pp

"Dok Akad Nauk SSSR, Nova Ser" Vol LVI, No 6

Describes results of an experiment in which isothermal
models of alloy properties were constructed and placed
in isococoncentrates with a constant solvent content.

Submitted by Academician I. I. Cherayayev, 25 Oct
1946.

5876

Theoretical and genetic crystal types of ophakite

V. I. Mikhreeva and I. I. Shafranovskii. *Zapiski Vuzovskogo Mineral'nogo (Mem. Soc. Russ. Mineral.)* 77, 207-71 (1948). The crystal habit is determined not only by the geometrical factors of the structure, but also by physico-chemical conditions. For the geometric factors, Bravais law postulates a distinct equiaxed habit, which, however, is modified by external forces. A statistical method of studying such factors is that of Wells (c. d. 41, 2966v). The tetrahedral type is more frequently observed in Zn-Pb ores of a high grade, the dolosahedral in Zn-Pb

ore deposits of younger age, and metamorphic origin, with siderite, fluorite, and barite. These different types express the different nature characters of the different types of the ophakite structure, which is affected by the external forces during the ore genesis. In the first case, the habit is chiefly determined by the S factors in the solid solution; in the second type the geometric factors prevail. Another important mineral which indicates such effects on its habit is *zinnwaldite*. The chemistry of the surrounding medium is different in SiO₂-rich media, which being about the tabular (0001) habit, and in low siliceous media, with barrel-shaped or elongated pyramidal habits (Ozawa, c. d. 40, 4117v). In the first type, the growth in the direction is impeded by SiO₂ ions absorbed from the medium on the tabular faces. (W. L. 1948)

MIKHEYEVA, V. I.

Magnesium Alloys with Aluminum and Zinc, (booklet), 1949.

NIKOLAEVA, V. I.

27741. NIKOLAEVA, V. I. i MIKESHIN, V. I.--sравnitel'noye issledeniye svoystv i tekhnol. in-ta, vyp. 1, 1966, S.12-11. 100 str: 1 nary.

SC: Ietopis' Zhurnal'nykh Statey, vol. 17, 1966.

MIRHEYEVA, V.I.

Application of the law of mass action to the analysis of the structure of condensed binary and ternary intermetallic systems. V. I. Mirheyeva. *Zhurnal Fiz. Khim.* 1974, vol. 48, no. 17, 174 (1974). A theoretical study was made of ternary diagrams that consist of a single compd. A₂B, in equil. with the solid soln. of the nonactive solvent metal, C, and with an excess of either metal A or B. The fact that A₂B₂ might be a boron-rich phase (i.e., of eutectic compn.) rather than a strict stoichiometric compd. was explained in terms of a finite degree of disorder in the solid solution. The actual degree of disorder, α , depended on compn. The purpose of the study was to determine the shape of curves of activity of compn. and of various surfaces in equil. diagrams. The law of mass action was used in the ideal form, assuming that the activity coeffs. were independent of compn. Using 100 mols. of A₂B as a base, the law of mass action was written: $\frac{a_A a_B}{a_C} = K$, where a and b were the activities of the components over the stoichiometric ratio, and α was the mol. occupied by 100 mols. of A₂B. It was assumed that α was an additive quantity: 100 atoms of any component occupied unit vol. It was convenient, in applying this law to ternary systems, to consider reactions having a certain percentage, α , of the solvent, C. Equation 1 then took the power form if α was replaced by $100 + (\alpha \text{ or } b) + (100 - \alpha) \frac{b}{a}$ (or $\frac{b}{a}$). Calculations were made of the mol. compn. for the following conditions: compd. A₂B, $\alpha = 0\%$; $\alpha = 2$, at % A 22.7-31.81; compd. AB, $\alpha = 60\%$, $\alpha = 10$, at % A 6.58-31.32%; compd. AB, $\alpha = 10\%$, $\alpha = 10$, at % A 0.93-1.01%. Curves of property vs. compn. were obtained by the use of typical curves, due to Kurnakov, of property vs. compn. of dissolved substance. The latter curves were: III, a symmetrical curve that increased from 0 at either end of the compn. axis to a max. in the center; this curve was characteristic of two substances with equal interaction effects; II, an asym. curve with an off-center max.; I, a curve that increased continuously

with increase in compn.; the latter 2 curves represented increasing degree of nonequality of interaction effects. Curves of property vs. compn. for compd. AB, and interaction III showed a min. at AB, for $\alpha = 0$, but the min. was displaced to a higher percentage of B and to higher values of property as α was increased in steps to 5. The curves for interaction I were similar. The curves for interaction I also showed the min., but in addition a max. appeared at a certain α below the min. For $\alpha = 0$ the max. was at 72% B, and it moved to almost 77% B for $\alpha = 4$. When small amts. of C up to $\alpha = 15$ were added to AB, for interaction III and for $\alpha = 0.5$ the min. was displaced to higher property values. For interactions II and I the min. were also lowered and were displaced to higher B contents. In some cases of nonadditive changes of properties and for interaction III it was possible for the addn. of small amts. of C to change the min. into a max. In the region of primary pptn. of the solvent, C, when the compn. of A + B was held at 10% and for interaction III, the curves of property vs. compn. min. at the AB compn. for $\alpha = 0, 2, 5$, and 10, and the value of the min. increased in this order. For $\alpha = 30, 40$, and 60 the min. was absent. With $\alpha = 10$, for A + B = 2, 5, 10, 20, and 40% and for condition II the property values increased sharply with increase in percentage of A up to AB and then leveled off (for A + B = 2%) or gradually decreased. Deductions were made about the form of the elements of ternary equil. diagrams by use of Kurnakov's rule that the exchange of one independent variable (temp.) for another (variable compn. of C) does not affect the topological structure of a diagram. In the region of soln. of a binary compd. there was a fold with a singular polythermal tip of the eutectical type for metals and of the azeotropical type for disordered compds. Min. or max. occurred in the surface of the limit of solid soln. of a compd. in the solvent in correlation with min. or max. in isotherm polytherms. Hume-Rothery made an error in his calculation of the soln. isotherms of MgSi and AlMgSi in neglecting the vol. factor.

A. G. Giv

Principles involved in the construction of a melting diagram for binary metal systems. V. L. Mikhailov and I. V. Kuznetsov (N. S. Kurnakov Inst. of Gen. and Inorg. Chem., Acad. Sci. U.S.S.R.), *Izv. Akad. Nauk SSSR Khim. Nauk*, 1964, No. 1, 1-10. (1964). Three distinct types of melting diagrams are analyzed: Al-Mg-Cu, Al-Mg-Zn, and Mg-Cu-Zn. Of these, in the 1st crystalline stable compounds, Al₃Cu and Al₃Cu, so-called eutectics. The diagram there, the other 2 diagrams is different: these 2 systems form no eutectics. The behavior of the intermetallic compounds in the systems Al-Mg-Zn and Mg-Cu-Zn is complicated by the application of the mass law assuming the formation of the intermetallic compounds. The nature of the liquidus diagrams of these 3 ternary systems indicates that the ternary compounds formed result from a number of reactions of binary intermetallic compounds, taking place simultaneously. The singular elements corresponding to the formation of these compounds are brought out more clearly by the crystal. area of the solvent than by the compound itself. The diagrams of state and the nature of the metal alloys can be explained only by the chemical reactions between the metals and the nature of the intermetallic compounds formed in the course of these reactions. M. H. H.

MIKHEYEVA, V. I.

The Chemical Nature of High Strength Alloys of Aluminum with Magnesium and Zinc,
1950.

MIKHAYEVA, V. I.

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Melting diagram of the system copper-magnesium-zinc.
 V. I. Mikhayeva and V. N. Kryukova. *Izv. Akad. Nauk S.S.S.R. Khim. Anal., Akad. Nauk S.S.S.R.* 20, 76-80 (1980).—The phase diagram of the system was constructed from the results of thermal analysis and from microstructure studies. The phase diagram showed the existence of 2 intermetallic phases I and V. Phase I extended over a large crystalline area. At an equatm. ratio of all 3 components phase I had an apparent max. m.p. The properties of this phase indicated its berthollide nature. Phase V occupied only a small area. It formed from I by peritectic reaction and in its pure state had the compn. CuMg_2Zn . It appeared to be a triple salt. The diagram indicates that V formed according to $\text{Cu} + 2\text{MgZn} \rightleftharpoons \text{CuMg}_2\text{Zn}$. CuMg_2Zn resulted from a no. of simultaneously occurring reactions between single components and binary or pseudobinary compds. I extended over a wide range of temp. and concn. and its field of homogeneity and chem. compn. depended on these changes. M. Hoshino

MIKHEYEVA, V. I.

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Chem 2

chem abs 148
1-25-54
Inorganic chemistry

Reaction of magnesium boride with water V. I. Mikheyeva and V. Yu. Surs *Doklady Akad. Nauk S.S.S.R.* 91, 1134-5 (1953). Reaction of H_2O or dil. acids with B_2Mg produces H ; the aq. exts. decolorize iodine solns. Treatment of the aq. ext. with KOH , filtration of $Mg(OH)_2$, evapn. in vacuo, and extn. of excess KOH with abs. $EtOH$ gave yellow crystals; these give an alk. soln. in H_2O , which vigorously reduces salts of the heavy metals, and with $NiSO_4$ gives Ni boride. Detn. of B by titration with alkali in presence of mannitol, of K as K_2SO_4 , and of H as active H and by calcining in O_2 , indicated the compn. $KBH(OH)_2$. with only 1 active H ; the product is the result of partial hydrolysis of KBH_3 . G. M. Kozlov

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4-21-54

MIKHEYEVA, V. I.

USSR/Chemistry - Boron Hydrides

1 Nov 53

"The Chemical Nature of Potassium Hypoborate," V. I. Mikheyeva and V. Yu. Surs

DAN SSSR, Vol 93, No 1, pp 67-69

Passed diborane (I) and tetraborane (II) through solns of KOH of different concs and detd the ratio of evolved H to B on acidification of the resulting solns to be 5 for I and 6 for II (for concs of KOH not lower than 30%). Comparison of the properties of the solid products of the above reactions and of the analyses of these products indicates that the solid products from I and II are identical.

275T6

Their comp is expressed by the formula KBO_2H_4 . The hydrolysis of KBH_4 can proceed to any one of three stages, depending on the conc of KOH, the temp, and the external pressure. Presented by Acad I. I. Chernyayev 4 Sep 53.

MIKHEYEVA, V. I.

U.S.S.R.

Binary boron hydrides and analogs. V. I. Mikheyeva.
Dokl. Khim. 23, 831-866 (1954). - A review with 110 refer-
ences. G. M. Khasanov

Author : Mikheyeva, V. I. (Moscow)

Title : Binary hydrides of boron and of its analogs

Periodical : ~~Usp. Khim.~~ 33, 831-866, 1954
APPROVED FOR RELEASE 06/14/2000 CIA-RDP86-00513R001134120011-

Abstract : The characteristics and possible uses of the hydrides are discussed. Some suggestions for their nomenclature which is not yet fully established are mentioned. Six tables, 110 references (12 Russian: 1907-1953).

Institution : None

Submitted : No date

MIKHEYEVA, V. I.

USSR/ Chemistry - Hydrolysis

Card 1/1 Pub. 22 - 26/51

Authors : Mikheyeva, V. I., and Fedneva, E. M.

Title : Hydrolysis of lithium borohydride

Periodical : Dok. AN SSSR 101/1, 99-101, Mar 1, 1955

Abstract : The multistage nature of LiBH_4 hydrolysis is described. Experiments showed that the hydrolysis in water at 20° is followed by the separation of one of the four hydrogen atoms of LiBH_4 and the formation of a $\text{LiBH}_3\text{-OH}$ compound which was found stable at the given reaction conditions. When heated to 100° the compound undergoes the stage of decomposition followed by the displacement of the second hydrogen atom by the hydroxyl group and formation of a product $(\text{LiBH}_2(\text{OH})_2)$, (product of the second hydrolysis phase). An acidified NiCl_2 solution results in complete hydrolysis of the lithium borohydride and the formation of lithium borate where all four hydrogen atoms are replaced by the hydroxyl group. Six references: 5 USA and 1 USSR (1940-1953). Tables.

Institution : Acad. of sc., USSR, The N. S. Kurnakov Institute of Gen. and Inorg. Chem.

Presented by : Academician I. I. Chernyaev, September 11, 1954

AL'TMAN, Morits Borisovich; LEBEDEV, Aleksandr Aleksandrovich; POLYANSKIY, Aleksey Pavlovich; CHUKHROV, Matvey Vasil'yevich; MIKHEYEVA, V.I., professor, doktor, retsenzent; KRYMOV, V.V., kandidat tekhnicheskikh nauk, retsenzent; FRIDLYANDER, I.N., kandidat tekhnicheskikh nauk, retsenzent; TELIS, M.Ya, inzhener, retsenzent; KRYSIN, B.T., retsenzent; LUZHNIKOV, L.P., redaktor; KAMAYEVA, O.M., redaktor izdatel'stva; ATTOPOVICH, M.K., tekhnicheskii redaktor

[Melting and casting of light alloys] Plavka i lit'e legkikh splavov. Moskva, Gos. nauchno-tekhn. izd-vo lit-ry po chernoi i tsvetnoi metallurgii, 1956. 491 p. (MIRA 9:10)
(Alloys--Metallurgy)

MIRHEVA, V.I.

MIRHEVA, V.I.

Reaction of the etherate of boron trihydride with lithium hydride. ⁷ I. Preparation of diborane of exceptional purity. ²
 L. I. Mikhaylova and R. M. Fedner. *Izv. Akad. Nauk S.S.S.R., Otdel. Khim. Nauk* 1956, 902-12. A study of the reaction of $\text{BF}_3 \cdot (\text{Et}_2\text{O})_2$ with LiH showed that it consists of a no. of reactions which take place similarly and consecutively and which yield, as final products, the boron-contg. compounds, diborane, lithium borohydride, and lithium borofluoride. The yield of diborane is affected by the reaction temp., ratio of reactants, rate of stirring, and the order in which the reactants are mixed. An almost quant. yield is obtained if the reaction is started at an elevated temp. (25-30°) for a $\text{BF}_3 \cdot \text{LiH}$ ratio of 1:2.4-2.8 and if the etherate is added slowly to the LiH with continuous mixing. This is the simplest and most economical method for prep. of diborane of a high degree of purity (m.p. -185°).
 J. Rastar Leach

PM MK

MIKHEYOVA, V.I.

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4E3d
4E4j

27
Reaction of the etherate of boron trichloride with sodium
hydride. Preparation of diborane of exceptional purity.
I. Mikheyova and R. M. Kozlov. *Dokl. Akad. Sci.
U.S.S.R., Div. Chem. Sci.* 1936, 926-27 (English transla-
tion). *see C.A.* 31, 4191g.

W. J. ...
Gorb

MIKHEYEVA, V.I.

✓12215* (Russian.) Preparation of Tetraborane by the Hydrolysis of Borides. Poluehenie tetraborana gidrolizom boridov. V. I. Mikheeva and V. Yu. Markina. Zhurnal Neorganicheskoi Khimii, v. 1, no. 4, 1956, p. 819-827.
Study of the reduction of B anhydride with Mg or other metals such as Be or Al. Effect of the nature of the acid. Distillation of tetraborane and determination of its purity and properties.

chem 2
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MIKHEYEVA, V.I.

✓ The complex compounds of the boron hydrides with alko-
 ges containing organic bases. I. Compounds of diborane
 with pyridine and quinoline. V. I. Mikheyeva and R. M.
 Rednaya (N. S. Kurnakov Inst. Gen. and Inorg. Chem.,
 Acad. Sci. U.S.S.R., Moscow). Zhur. Neorg. Khim. 1,
 891-902 (1956).--The following compds. of diborane with
 pyridine and quinoline were prepd. by passing BH_3 through
 the dry bases: $C_5H_5N.BH_3$ (I), $C_8H_7N.BH_3$ (II) (m.p. 10-12°
 at 95-3° and decompn. tempa. 155-160° and 118°, resp.).
 The mol. wt. was detd. cryoscopically in CH_2 and $PhNO_2$.
 The degree of assocn. increases rapidly with concn. in a
 nonpolar solvent (CH_2) and slowly in a polar solvent (Ph
 NO_2). The action of BH_3 , BF_3 and $AlCl_3$ on I results in the
 evolution of BH_3 with a yield of 67-88% and 20%, resp.
 The thermal decompn. curves of I and II and their decompn.
 products were studied.

9
 4E30
 4E4j

R.M. Rednaya
 016

NIKHEYEVA, V.I.

27
Study of the reaction of aluminum chloride with lithium hydride in an organic solvent. 1. Synthesis of lithium aluminum hydride. V. I. Nikheyeva, E. M. Kuznetsova, and Z. L. Shpil'tseva. Zhur. Neorg. Khim. 1, 2140-50 (1956).
This is the first article in a proposed systematic study of the reaction of $AlCl_3$ with LiH to det. conditions for obtaining high and reproducible yields of $LiAlH_4$ in the form of a solid, stable product. The reaction was studied in ether. Conditions were defined for obtaining $LiAlH_4$ in a const. yield. The mechanism of the reaction was discussed, and the metastable character of the combdn. AlH_3 and AlH_2AlCl_2 was indicated. J. Rovtar Leach

4E4
4E3d

prolong

NIKHETEVA, V.I.

~~Synthesis of borazole by the reaction of lithium borohydride with ammonium chloride.~~ ~~I. Nikheteva and Yu. Markov. Zhur. Neorg. Khim. 1, 2700-7(1974).~~
 The app. and exptl. conditions are given for prep. borazole of high purity from LiBH_4 and NH_4Cl with a yield of 40%.
 The yield, based on the LiBH_4 , increases as the ratio $\text{NH}_4\text{Cl}:\text{LiBH}_4$ is increased, reaching a max. for a ratio of 2:1 and then it decreases. The thermal stability of borazole was detd. and shown to be very high. It was also found that borazole could be stored for prolonged periods of time under moisture-free conditions.
 J. Rovtar Leach

4E4j
 4E3d

PM fra
 0016

MIKHEYEVA, V.I.

USSR/Inorganic Chemistry Complex Compounds.

Abs Jour : Referat. Zhurnal Khimiya, No 6 1957, 18319

Author : V.I. Mikheyeva, Ye.M. Fedneva.

Inst : Academy of Sciences of USSR

Title : Study of Reaction of Ethylate of Boron Trifluoride with Lithium Hydride. Report 1. Preparation of Diborane of Individual Purity.

Orig Pub : Izv. AN SSSR. Otd. khim. n., 1956, No 8, 902-912

Abstract : The mechanism of the reaction of LiH with BF₃ ethylate is complicated. The possible courses of reaction are:
 $6\text{LiH} + 2\text{BF}_3 \rightarrow \text{B}_2\text{H}_6 + 6\text{LiF}$; $6\text{LiH} + 8\text{BF}_3 \rightarrow \text{B}_2\text{H}_6 + 6\text{LiBF}_4$;
 $4\text{LiH} + \text{BF}_3 \rightarrow \text{LiBH}_4 + 3\text{LiF}$; $\text{BF}_3 + \text{LiF} = \text{LiBF}_4$; $\text{BF}_3 + 3\text{LiBH}_4 \rightleftharpoons \text{B}_2\text{H}_6 + 3\text{LiF}$ and others.
 B_2H_6 (in the gaseous phase), LiBH₄ and LiBF₄ (in the solid remainder after distilling ether off) are formed as final boron containing substances. The yield of B₂H₆ is influenced by the temperature, interrelation and order of adding the reagents and the intensity of stirring. The best results are obtained at 25 to 30° at the initial reaction stage. gradu-

Card 1/2

-2-

Category: USSR / Physical Chemistry
Thermodynamics. Thermochemistry. Equilibrium. Physico-
chemical analysis. Phase transitions.

B-8

Abs Jour: Referat Zhur-Khimiya, No 9, 1957, 29933

Author : Mikheyeva V. I., Babayan G. G.

Inst : Academy of Sciences USSR

Title : Fusion Diagram of the System Magnesium - Copper - Nickel

Orig Pub: Dokl. AN SSSR, 1956, 108, No 6, 1086-1087

Abstract: By methods of thermal analysis and microstructure a study was made of the Mg - Cu - Ni system. Binary Mg₂Cu - MgNi₃ section divides the fusion diagram of the system in two parts in which crystallization takes place independently. The fusion diagram includes fields of primary crystallization of Mg₂Ni, Mg₂Cu, fields of solid solutions MgCu, MgNi₃, Cu - Ni and solid solution of Mg base. There are six lines of monovariant equilibrium and two non-variant points; triple eutectic (480°, 84.2 at. % Mg, 15% Cu) and transformation point

Card : 1/2

-48-

Category: USSR / Physical Chemistry
Thermodynamics. Thermochemistry. Equilibrium. Physico-
chemical analysis. Phase transitions.

B-8

Abs Jour: Referat Zhur-Khimiya, No 9, 1957, 29933

(540°, 65 at .% Mg, 33.5% Cu). The possibility is confirmed of the formation within boundaries of uniform phase of solid solutions between compounds of MgCu and MgNi, of a compound of the assumed composition MgCuNi, which is revealed only by isotherms of Mg field.

Card : 2/2

-49-

MIKHEYEVA, V. I.

✓ The chemical nature of the ternary intermetallic phases in the magnesium-copper-zinc and magnesium-copper-nickel systems. V. I. Mikheyeva and G. G. Babayan, *Fiz. Acad. Sci. U.S.S.R., Ser. Chem.* 169, 475-8 (1969) (English translation).—See C.A. 51, 9282b. B. M. R.

pin A...

Thermal decomposition of lithium aluminum hydride. V. 4
 L. Mikhaylov, M. S. Selivokhina, and O. N. Kuvshova.
 Doklady Akad. Nauk S.S.S.R. 109, 541-3(1956). LiAlH₄
 is used for reduction by heating it with reducible substances,
 and the conditions for thermal decompos. of LiAlH₄ must be
 known. The thermograms obtained show the LiAlH₄ to be
 entirely stable thermally below 140-145°. Above that temp.
 H₂ begins to evolve, with heat absorption. Three endo-
 thermal effects were observed (in N₂), particularly in the
 differential heating curve. About 1/3 of the total H₂ is
 evolved at 154-161°, 1/3 of the remaining at 197-237°, and
 all H₂ at 580-586°. The cooling curve of the residue has an
 exothermal effect at 600°, and the residue is a 2-component
 Li-Al alloy with 15-18% Al. The method can be used to
 produce high-purity Al-Li alloy if the decompos. is effected
 without access of air and moisture. W. M. Stroganov

USSR, Thermodynamics, Thermochemistry, Equilibria, Physico-Chemical Analysis, Phase Transition. B-6

Ass Jour : Ref Zhur - Khimiya, No 3, 1967, No 25137

Author : V.I. Mikhayeva, G.G. Babayan

Inst : Academy of Sciences of USSR.

Title : Chemical Nature of Ternary Intermetallic Phases in Systems Magnesium - Copper - Zinc and Magnesium - Copper - Nickel.

Orig Pub : Dokl. AN SSSR, 1966, 109, No 4, 765-766

Abstract : The existence of chemical compounds $MgCuZn$ and $MgCuNi$ was established by the method of measuring the electric resistance and its temperature factor in the regions of homogeneity of the solid phase in the systems $Mg-Cu-Zn$ and $Mg-Cu-Ni$. The solid phases of these systems may be considered as ternary peritectides - phases containing the above mentioned compounds in the state of dissociation or in the state of change of component valence.

Card : 1/1

MIKHEYEVA, V I

78-3-16/35

AUTHORS: Mikheyeva, V. I. and Fedneva, Ye. M.

TITLE: Complex Compounds of Boron Hydrides with Nitrogen-Containing Organic Bases. (Kompleksnyye soyedineniya borovodorodov s azotsoderzhashchimi organicheskimi osnoverniyami.) II. Compounds of diborane with aniline and dimethylaniline. (Soyedineniya diborana s anilinom i dimetilanilinom.)

PERIODICAL: Zhurnal Neorganicheskoy Khimii, 1957, Vol.II, Nr.3, pp. 604-605. (USSR)

ABSTRACT: In this report, which was presented at the VII All-Union conference on the chemistry of complex compounds on October 11, 1956, the reaction of gaseous diborane with aniline and dimethylaniline cooled to 0°C is described. The compounds obtained were: with aniline $(C_6H_5)_2N_2H_2BH$, for which the structure $(C_6H_5NH)_2BH$ is proposed; with N,N-dimethylaniline, $C_6H_5N(CH_3)_2.BH_3$. There is 1 figure and 4 references, 2 of which are Slavic.

SUBMITTED: November 22, 1956.
Card 1/2

MIKHEYEVA, V. I.

USSR/Inorganic Chemistry. Complex Compounds.

C

'Abs Jour: Ref. Zhur. Khimiya, No 1, 1958, 657.

Author : Mikheyeva, V.I., Shamray, F.I., Krilova, E.Ya. - I;
Mikheyeva, V.I., Markina, V. Yu., Kryukova, O.N. - II;
Shamray, F.I., Mikheyeva, V.I., Krilova, E.Ya. - III;
Mikheyeva, V.I., Shamray, F.I., Krilova, E.Ya. - IV.

Title : Preparation of Amorphous Boron of High Purity - I;
Physico-chemical Analysis of Reaction of Magnesium and
Boron Anhydride - II;
Purification of Amorphous Boron - III;
Problem in Evaluation of Quality of Amorphous Boron - IV.

Orig Pub: Zh. Neorgan. Khimii, 1957, 2, No 6, 1223-1231; 1232-1241;
1242-1247; 1248-1253.

Abstract: I. A study was made of the reduction reaction of B_2O_3 with me-
talllic Li, Na, K, Be, Mg, Ca and Al, employing methods of thermo-

Card : 1/4

-3-

APPROVED FOR RELEASE: 06/14/2000

CIA-RDP86-00513R001134120011-7

USSR/Inorganic Chemistry. Complex Compounds.

Abs Jour: Ref. Zhur. Khimiya, No 1, 1958, 657

graphy and chemical analysis to the solid reaction product ob-
tained by acid treatment. It was confirmed that concurrently
with borides of constant composition, CaB_6 and AlB_{12} , amorphous
phases of varying composition were also formed in large amount
during reduction of B_2O_3 with Na, K, Li, and Mg. To obtain amor-
phous boron (I) on a plant scale, the thermal reaction for re-
duction of B_2O_3 with Mg is recommended which, even after first
acid treatment, secures a content of $\sim 80\%$ in the form of basic
mixture - Mg.

II. The reaction of B_2O_3 with Mg was studied employing methods
of differential thermal and complete chemical analysis of the
reaction products while varying the concentration of each of
the components of the reaction mixture from 0 to 100%. The
basic reactions for preparation of boron by the thermal reduc-
tion process with magnesium were determined and the composition

-4-

Card : 2/4

MIKHEYEVA, V.I.; DYMOVA, T.N.

Investigating the interaction between boron trichloride and
hydrogen in the presence of aluminum and some of its alloys.
Zhur. neorg. khim. 2 no.11:2530-2538 N '57. (MIRA 11:3)
(Boron chloride) (Hydrogen) (Aluminum)

MIKHAYEVA, V.I.; DYMOVA, T.N.

Using activated carbon in practical work with diborane and
boron trichloride. Zhur. neorg. khim. 2 no.11:2539-2542 N '57.
(MIRA 11:3)

(Carbon, Activated) (Boron hydrides) (Boron chloride)

MIKHAYEVA, VI

20-1-27/54

AUTHOR
TITLE

MIKHAYEVA V.I., KOST M.Ye.

Interaction of Cerium with Hydrogen.

(O vzaimodeystvii tseriya s vodorodom -Russian)

PERIODICAL

Doklady Akad.Nauk SSSR, 1957, Vol 115, Nr 1, pp 100-102 (U.S.S.R.)

ABSTRACT

Metal cerium begins to absorb the hydrogen in which it is heated at 250-300° C and forms a hydride of varying composition. I.I. Zhukov asked whether there existed a cerium hydride of a stoichiometric composition CeH_2 . It was confirmed by calorimetric investigations by K.Kialer. On that occasion a hydride CeH_2 was further obtained. As initial metal for the present work cerium with a content of 2,9 Ni and Pr was used. The determination of the hydrogen connected with cerium was performed in parallel by three methods: 1) according to the amount of hydrogen absorbed (pressure drop in the system), 2) according to the increase in weight of the cerium-metal sample, and 3) according to the hydrogen volume which escapes on solution of the hydride in diluted HCl. In the hydration it was found that, in contrast to published data, the hydration of cerium, after careful purification of the initial products, takes place at room temperature without previous heat-treatment of the sample. The composition of the product developing on this occasion varies between CeH_3 and $CeH_{3.16}$. This composition is independent of hydrogen pressure. The following conclusion may further be drawn from the results obtained. The curve of dependence of the hydride composition on temperature, and the curves of hydration speed confirm the formation

Card 1/2

Mikheyeva, V. I.

78-2-2/41

AUTHORS: Mikheyeva, V. I., Kost, M. Ye.

TITLE: On Ceric Hydrides (O gidridakh tseriya)

PERIODICAL: Zhurnal Neorganicheskoy Khimii, 1958, Vol. 3, Nr 2, pp. 260-268 (USSR).

ABSTRACT:

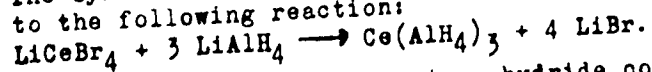
The ceric hydrides were synthesized by hydrogenation and then the thermal decomposition of the hydrides was investigated. The hydrides were produced of metallic cerium and hydrogen under a pressure of 30-35 atmospheres at a temperature up to 300° C in the course of 5-8 hours. Besides, the hydrides were also produced by hydrogenation at room temperature. On that occasion the hydride $\text{CeH}_3 (\pm 2\%)$ and in some cases a hydride with a higher hydrogen content, namely $\text{CeH}_{3.15}$, were determined. The dependence of the hydrogenation of cerium on temperature shows that at temperature up to 200° C the absorption of hydrogen at first takes place slowly and increases in temperature. With the temperature increase from 200-700° C the velocity of the hydrogen absorption again decreases and it is not above 700° C that it again increases. It was proved that ceric hydride - CeH_3 - is stable up to 200° C and that it decomposes to CeH_2 at higher temperatures with the escape hydrogen.

Card 1/2

78-2-2/43

On Cerio Hydrides.

CeH_2 melts at 1080°C with the beginning of decomposition.
The synthesis of cerio aluminum hydride takes place according to the following reaction:



The synthesis of cerio-aluminum hydride confirms the existence of CeH_3 as a chemical compound. There are 9 figures, 1 table, and 26 references, 6 of which are Slavic.

SUBMITTED: February 27, 1957

AVAILABLE: Library of Congress

Card 2/2

78-3-3-3/47

AUTHOR: Mikheyeva, V. I.

TITLE: The Works by N. S. Kurnakov and His Pupils on the Theory of the Phase Diagrams and Their Importance to Anorganic Chemistry (Raboty N. S. Kurnakova i yego uchenikov po teorii diagramm sostoyaniya i znachenie ikh dlya neorganicheskoy khimii)

PERIODICAL: Zhurnal Neorganicheskoy Khimii, 1958. Vol 3, Nr 3 pp. 562-570 (USSR)

ABSTRACT: Based on the investigations of the phase diagrams by N. S. Kurnakov the equality of the diagrams for salts, organic compounds and metals was determined. N. S. Kurnakov and his teacher Bertole assume that in the formation of bertolides a dynamic equilibrium prevails. The dissociation phenomenon, the modification of the valence and the occurrence of the free valences in the metallic phases are of great importance for the production of alloys and for the chemistry of semiconductors as well as for the theory of the heterogeneous catalysis. In investigations of ternary systems interesting rules were determined. The phase diagram is the expression of

Card 1/3

The Works by N. S. Kurnakov and His Pupils on the 78-3-3-3/47
Phase Diagrams and Their Importance to Anorganic Chemistry

the chemical reactions occurring in the given systems. The phase diagrams of the ternary systems indicate the result of some equilibrium reactions. Thus e. g. compounds like MgCuZn , $\text{Al}_2\text{Mg}_3\text{Zn}_3$ and MgCuNi occur in the systems

Mg-Cu-Zn , Al-Mg-Zn , Mg-Cu-Ti . The school of N. S. Kurnakov devoted special attention to the works on the chemistry of hydrides and the increase of the stability of hydrides by addition of complex partners. The investigations on the thermal decomposition of the hydrides showed that in this decomposition a stepwise decomposition of hydrogen occurs. By the investigations of the metallic hydrides the equality between the metallic alloys and hydrides was determined. In the investigations of the phase diagrams new physico-chemical methods were employed. The occurrence of the free valences in the metallic compounds explains the use of the metallic alloys as components in chemical reactions and as catalysts. The reaction of the metallic alloys with metals is of great importance for anorganic chemistry, especially as catalysts. The phase diagrams of the metallic alloys

Card 2/3

The Works by N. S. Kurnakov and His Pupils on the Phase Diagrams and Their Importance to Anorganic Chemistry 78-3-3-3/47

may be considered a result of the chemical reactions. The complete and extensive investigations of the phase diagrams of metallic alloys as well as the far-reaching modification of the concentration of the components lead to highly different alloys which are of great interest in engineering and science.

There are 5 figures and 45 references, 36 of which are Soviet.

ASSOCIATION: Institut obshchey i neorganicheskoy khimii im. N. S. Kurnakova Akademii nauk SSSR (Institute for General and Inorganic Chemistry imeni N. S. Kurnakov, AS USSR)

SUBMITTED: June 25, 1957

Card 3/3

AUTHOR: Mikheyeva, V. I.

78-3-3-11/47

TITLE: Discussion on Lectures (Obsuzhdeniye dokladov)

PERIODICAL: Zhurnal Neorganicheskoy Khimii, 1958, Vol. 3, Nr 3,
pp. 605-606 (USSR)

ABSTRACT: V.I. Mikheyeva says that that part of I.I. Kornilov's lecture (1st plenary meeting) seemed especially valuable to her in which he spoke on metalloids and non-metal phases. According to her opinion they actually decrease the number of components of the complex equilibrium, and the complex systems can be easier understood by them. However, from 6 components no 2-component system can be obtained. From the point of view of kinetic mechanics of the reaction process the number of components will hardly change. The second remark by Mikheyeva deals with the accelerated method of investigation of the phase diagram. Still in 1932 the opponent submitted to N.S. Kurnakov her work on the accelerated investigation of the phase diagram according to the investigation values of the diffusion layers. He advised her to continue working on this problem. She arrived at the conviction that the equilibrium in thermal working was the most important

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78-3-3-11/47

Discussion on Lectures

point, that it was, however, not obtained by accelerated methods. They can still be used as methods of investigation. It is however, hardly possible to draw conclusions on the phase diagram from the values obtained by accelerated methods. The lecturer also criticized the backwardness in the field of the investigation of the phase diagrams and she demanded its reorganization. Not only one system and 20 samples but 200 samples should be analysed. These works should also be carried out at various institutions according to corresponding methods. For instance, the Institute for Metallurgy carries out the melting and thermal treatment of the alloys, the IONKh investigates chemically the same alloys, various universities can investigate their physical properties using most precise physical measurements, etc.

ASSOCIATION: Institut obshchey i neorganicheskoy khimii Akademii nauk SSSR.
Moskva (Moscow Institute for General and Inorganic Chemistry
AS USSR)

Card 2/2

SOV/78-1-10-1/35

AUTHORS:

Mikheyeva, V. I., Mal'tseva, N. N., Fedneva, Ye. M.

TITLE:

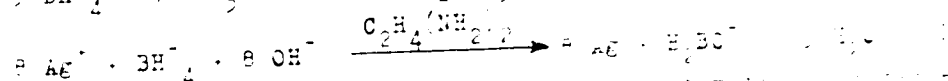
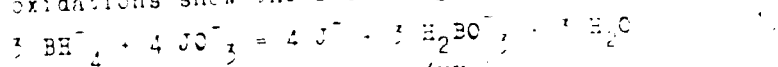
On the Reducing Power of Diborane and Some of Its Derivatives
(O vosstanovitel'noy sposobnosti diborana i nekotorykh yego
proizvodnykh)

PERIODICAL:

Zhurnal neorganicheskoy khimii, 1978, Vol. 5, Nr. 10, pp. 2227-2230
(USSR)

ABSTRACT:

The conditions of quantitative oxidation of diborane and some of the derivatives which it forms together with potassium permanganate, potassium permanganate and silver nitrate are investigated in the present paper. The oxidation of lithium borohydride, sodium borohydride and potassium borohydride with potassium permanganate and silver sulfate was carried out in aqueous solution. The oxidations show the following scheme:



Card 2

The hydride hydrogen was determined by argon gas displacement.

SOV, 78-1-10-11

On the Reducing Power of Diborane and Some of Its Derivatives

metric methods. Interaction between pyridine borane and water was studied when cooled down to 0°C. An insignificant decrease in the temperature, accompanied by loss of hydrogen, and no appreciable hydrolysis at 100°C were detected. The stability of pyridine borane against alkali lyse goes so far that it remains stable in solutions of 0.1 - 1 M NaOH for 20 hours. Pyridine borane reacts upon potassium iodide practically within a moment. The reaction of diborane upon potassium iodate and potassium permanganate was analyzed. The titration curve of potassium boron hydride with silver nitrate was taken. It was confirmed by the example presented by pyridine borane that the method of identification can be applied in the determination of active hydrogen in compounds of diborane with organic substances. The reaction of diborane sulfate and potassium permanganate upon pyridine complexes of diborane in the weakly alkaline medium is unsuitable for quantitative determinations. There are 4 figures, 6 tables, and 10 references, 3 of which are Soviet.

SUBMITTED: May 1, 1959

Card 2, 2

5(2), 18(6)

AUTHORS:

Mikhoyeva V. I. Dymova T. B.
Shkrabkina M. M.

SCV/75 4-4 2/44

TITLE:

Preparation of Sodium Hydride (O poluchenii
natriyevogo gidrida)

PERIODICAL:

Zhurnal neorganicheskoy khimii 1959. Vol 4. Nr 4.
pp 704-707, USSR

ABSTRACT:

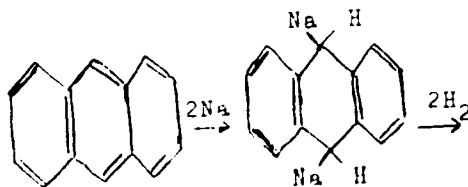
The conditions for a rapid synthesis of sodium hydride are given. Apparatus for carrying out the hydrogenation of sodium under static conditions and by using circulating hydrogen are given in figures 1 and 2. The experiments showed that under static conditions of 200 to 400° only trace amounts of sodium hydride are formed. The reaction of sodium with hydrogen in circulating hydrogen and in the presence of mineral oils and their aromatic fractions led to the formation of sodium hydride with a purity of 97 %. The method is recommended for producing sodium hydride in technical quantities. The synthesis of the sodium hydride was carried out with an addition of 0.5 - 1 % (relative to the weight of sodium) mineral oil and under a hydrogen pressure of 2 atmospheres

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Preparation of Sodium Hydride

SOV/78-4-4-2/44

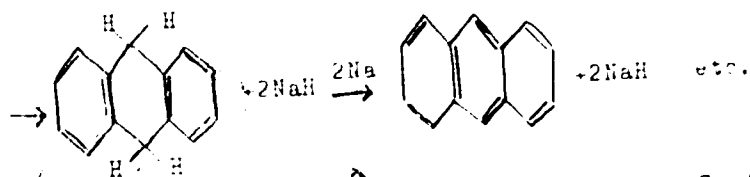
absolute pressure at $250 - 270^\circ$ in a reactor utilizing a mechanical stirrer (stirring velocity of 300 rpm). The process produces a product of 93 % sodium hydride in three hours. Using a 0.25 - 0.5 % aromatic catalyst 97 % sodium hydride was prepared under the same conditions. Table 2 gives a complete review of the yields given by various reactions. The effect of the catalyst added to the hydrogenation of the sodium is indicated in Figure 5. The activating effect of the aromatic substances is discussed, and it is assumed that these molecules provide a locus at which the sodium and hydrogen become proximally attached and react together:



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Preparation of Sodium Hydride

SOV/76-4-4-2/44



There are 5 figures, 2 tables, and 42 references, 7 of which are Soviet.

SUBMITTED: January 27 1955

Card 3/3

05852

SOV/78-4-11-5/50

5(2)
AUTHORS:

Mikheyeva, V. I., Selivokhina, M. S., Leonova, V. V.

TITLE:

On the Conditions of the Formation of a Chlorine-containing
Derivative of Aluminum Hydride

PERIODICAL:

Zhurnal neorganicheskoy khimii, 1959, Vol 4, Nr 11,
pp 2436-2442 (USSR)

ABSTRACT:

A survey of publications shows that there is disagreement on the precise composition and the properties of the compound AlH_nCl_{3-n} , which has so far not been prepared in crystalline state. The authors first repeated H. I. Schlesinger's experiments (Ref 1). They also obtained AlH_3AlCl_3 as a fuming, non-crystalline liquid. When studying the synthesis of $LiAlH_4$ under intense cooling and using coarse-disperse lithium hydride, they obtained, however, needle-shaped crystals (Fig 1) which contained aluminum, hydrogen, and chlorine, but no lithium. Their heating curve exhibits a thermal effect other than that of $LiAlH_4$ and is characterized especially by the explosive exothermic transformation at $109^{\circ}C$ (Fig 2). Analysis of this sub-

Card 1/2

05852

SOV/78-4-11-5/50

On the Conditions of the Formation of a Chlorine-containing Derivative of Aluminum Hydride

stance yielded the composition $\text{AlH}_n\text{Cl}_{3-n}\cdot\text{Et}_2\text{O}$ ($\text{Et} = \text{C}_2\text{H}_5$); the sum of hydrogen and chlorine was always too low and did not attain figure 3. The authors investigated the influence exercised by temperature, dispersiveness of lithium hydride and the velocity of addition of AlCl_3 upon the formation of this substance. The reaction of LiH with the solution of AlCl_3 in ether is (under otherwise equal conditions) highly sensitive to temperature. LiAlH_4 is produced within the temperature range $0-5^\circ\text{C}$ and above $18-20^\circ\text{C}$, in the range $4-12^\circ\text{C}$ primarily the chlorine-containing derivative is formed, which is unstable at LiH excess. Its formation is promoted by accelerated addition of AlCl_3 or by using coarse-disperse LiH . At temperatures about 0°C and maintenance of certain reaction conditions only pure LiAlH_4 is formed. There are 4 figures, 2 tables, and 13 references, 4 of which are Soviet.

SUBMITTED:
Card 2/2

August 14, 1958

... necessary to
... fundamental concepts in chemistry and

Card 1/11

Hydrides of Transition Metals

SOV/4927

the theory of physicochemical analysis, such as the definition of concepts of the chemical compound, the chemical individual and chemical solvent, and their exchange reactions. The book proposes to give a more detailed treatment than previous literature (1907 to 1941) of problems concerning the chemical nature of the transition metals, their properties and importance in determining regularities of the periodic system of elements, the preparation of hydrides by methods other than the direct hydrogenation of molecular hydrogen, and to present data obtained from the study of derivatives of the transition-metal hydrides of the boron and aluminum dihydride types, of mixed carbonyl hydrides, and of complex compounds containing hydride hydrogen. No personalities are mentioned. There are 678 references, mostly non-Soviet.

TABLE OF CONTENTS:

Introduction

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Card ~~2/11~~

PLANE I BOX INFORMATION

507/2164

Isoscopysoy sovetskoye po spetsialnoy metallor. 1st, Moscow, 1957
 Metallor. 1st, Moscow, 1957
 First All-Union Conference on Rare-Metal Alloys (Moscow, Metallurgicheskii, 1960.
 438 p. 3,150 copies printed.

Sponsoring Agency: Akademiya nauk SSSR. Institut metallurgii i mashinostroyeniya
 Komissiya po redkimi metallam pri moshinostroyeniye kumissii.

Ed.: I.I. Sazonov; Ed. of Publishing House: O.M. Isakov; Tech. Ed.:
 P.G. Isakov.

PURPOSE: This collection of articles is intended for metallurgical engineers,
 physicists, and workers in the machine-building and radio-engineering industries.
 It may also be used by students of schools of higher education.

CONTENTS: The collection contains technical papers which were presented and discussed at the First All-Union Conference on Rare-Metal Alloys, held in the halls of Metallurgicheskii, Moscow, USSR in November 1957. Results of investigations of the properties of rare-metal alloys, titanium and copper-base alloys with additions of rare metals are presented and discussed along with investigations of the properties of rare-metal alloys and their alloys. The effect of rare-earth metals on properties of magnesium alloys and steels is analyzed. The use of thorium as a dispersing additive in alloys is discussed. The properties of alloys containing rare metals and electrical steels are discussed. Also, the effect of the addition of certain elements on the properties of heat-resistant steels is examined and alloys with special physical properties (particularly semiconductive alloys) are discussed. The personalities are mentioned. Soviet and non-Soviet references accompany some of the articles.

PART II. TITANIUM AND COPPER-BASE
 ALLOYS WITH RARE-METAL ADDITIONS

Rare Metals (Cont.)

507/2164

Andreyev, I.I., A.I. Chukov, I.A. Isakov, I.I. Solov'ev, and M.Y.
 Mal'nev. Corrosion Resistance of Titanium and Its Alloys

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PART IV. RARE-EARTH METALS
 AND THEIR EFFECT ON PROPERTIES OF MAGNESIUM ALLOYS

Speshkov, D.I., and V.S. Sil'yevich. Rare-Earth Elements and Possibilities
 of Producing Them

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Koffa, I.M., V.M. Svyazkov, and I.P. Zhurav. Production of Aluminum-Cerium,
 Aluminum-Lanthanum, Magnesium-Cerium, Magnesium-Lanthanum, and Magnesium-
 Neodymium Alloys by Electrolysis

180

Terebush, V.Z., and I.M. Serzhitskiy. Investigation of Physicochemical
 Interactions of Rare-Earth Metals with Magnesium, Iron, Chromium and Titanium

189

Khibyeva, I.M., and M.Ye. Kost. Properties of Rare-Earth Metals and Possibilities
 of Their Production Utilization

202

Card 1/8

Микheyeva, V. I.

3/078/60/005/008/006/018
B004/B052

AUTHORS: Mikheyeva, V. I., Sterlyadkina, Z. K., Kryukova, O. N.

TITLE: Fusion Diagram of the System ^{Al}Aluminum - ^{Cu}Copper - ^{Li}Lithium

PERIODICAL: Zhurnal neorganicheskoy khimii, 1960, Vol. 5, No. 8,
pp. 1788-1795

TEXT: The authors first give a survey of the investigations published on the binary systems: Al - Cu (Ref. 3), Al - Li (investigated by F. I. Shamray and P. Ya. Sal'dau, Ref. 4), and Cu - Li (Refs. 5,6), and also a western paper (Ref. 7) on the ternary system. Then follows a description of their own method, the production of melts (analyses on Table 1), the thermal analyses by means of an N. S. Kurnakov pyrometer, and the investigation of the microstructure after etching with a 3 - 5% solution of HNO₃ in alcohol (Fig. 4). The total fusion diagram of the system (up to 75 atom% of Cu+Li) is depicted in Fig. 5, while Fig. 1 gives a section of Al₂Cu - AlLi, Fig. 2 of Al - Cu:Li = 4:1, and Fig. 3 of Al - Cu:Li = 9:1. Table 2 gives the data of the 15 points of the

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Fusion Diagram of the System Aluminum -
Copper - Lithium

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B004/B052

non-variant equilibrium. The system Al - Cu - Li is characterized by the crystallization of two ternary, incongruently melting phases the S-phase consisting of the compound Al_2CuLi , and the T-phase, whose composition in the homogeneity range approaches the compound Al_6CuLi_3 . At 526°C, the ternary eutectic which corresponds to the common crystallization of the solid aluminum solution, also to the θ -phase (Al_2Cu) and the S-phase (Al_2CuLi). has the following composition: 73% of Al, 18.6% of Cu, and 8.4% of Li. All other non-variant points are transitional points. There are 5 figures, 2 tables, and 12 references: 6 Soviet, 2 US, 1 British, 2 German, and 1 Italian. ✓

SUBMITTED: May 27, 1959

Card 2/2

83124

S/078/60/005/009/003/017
B015/B064

11. 1240

AUTHORS: Mikheyeva, V. I., Markina, V. Yu.

TITLE: The Reaction of Tetraborane With Pyridine and Trimethylamine

PERIODICAL: Zhurnal neorganicheskoy khimii, 1960, Vol. 5, No. 9, pp. 1977-1980

TEXT: The present paper was subject of a lecture held at the VIII. All-Union Congress of Complex Compounds in Kiev on May 29, 1959. The reaction taking place between tetraborane B_4H_{10} and pyridine, as well as BH_4 and trimethylamine was investigated. B_4H_{10} was passed through pyridine cooled to $0^\circ C$ in the hydrogen current. $B_2H_4 \cdot NC_5H_5$ (Table 1) was obtained as solid reaction product, and pyridine borane $BH_3 \cdot NC_5H_5$ (Table 2) as liquid reaction product. A gelatinous mass, apparently the pyridine borane polymer is formed when the liquid reaction product is left standing, when B_4H_{10} is passed through pyridine for a longer time; or in the case of a slight pyridine excess. The experiments on the reaction of B_4H_{10} with

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The Reaction of Tetraborane With Pyridine
and Trimethylamine

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trimethylamine confirm the data given by Burg and Stone (Ref. 7). i.e., B_4H_{10} forms three borine groups in the form of $BH_3 \cdot N(CH_3)_3$ and one solid polymeric substance is formed $[BH \cdot N(CH_3)_3]_n$ (Table 4). Compounds of the composition $B_3H_7 \cdot N(CH_3)_3$ that were pointed out by Edwards et al (Ref. 9) could not be found. The results of reacting B_4H_{10} with trimethylamine could be more easily explained if a pyramidal structure of B_4H_{10} were assumed (similar to pentaborane and dihydropentaborane). There are 4 tables and 17 references: 2 Soviet, 12 US, and 3 German

SUBMITTED: June 12, 1959

Card 2/2

88600

S/078/60/005/011/015/025
B015/B060

54120

AUTHORS: Mikheyeva, V. I., Breytsis, V. B.

TITLE: Solubility Polythermal Line of the NaBH_4 - H_2O System and
Solubility Isothermal Lines of the NaBH_4 - NaOH - H_2O System
at 0° , 18° , 30° and 50°C

PERIODICAL: Zhurnal neorganicheskoy khimii, 1960, Vol. 5, No. 11,
pp. 2553 - 2563

TEXT: Since the NaBH_4 - NaOH - H_2O system has a practical importance,
besides a theoretical one, and, as an example, serves for the application
of water as a solvent in a reduction under the application of sodium
borohydride, for exchange reactions, and the refining of sodium boro-
hydride, this system was here studied by means of classical methods of the
physical analysis for aqueous salt solutions. The visual-polythermal and
the isothermal method (Ref. 9) were applied to the solubility determina-
tion. Sodium borohydride was chemically determined by the volumetric
method, the iodate method, and the acid-base titration method, which have
Card 1/3

Solubility Polythermal Line of the NaBH_4 -
 H_2O System and Solubility Isothermal Lines of
 the NaBH_4 - NaOH - H_2O System at 0° , 18° , 30° and 50°C

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 S/078/60/005/011/015/025
 B015/B060

all been described by Jensen (Ref. 4). The solubility polythermal line (Fig. 1) was drawn on the basis of data of the freezing temperature of NaBH_4 solutions (Table 1), the solubility isothermal lines of the NaBH_4 - NaOH - H_2O system for 0° , 18° , 30° , and 50°C (Table 2), and also on the basis of Jensen's data (Ref. 4). Three crystallization lines have to be observed: that of ice, of dihydrate $\text{NaBH}_4 \cdot 2\text{H}_2\text{O}$, and of anhydrous NaBH_4 . The dihydrate forms a eutectic with ice at -37.5°C and a concentration of 21.8 wt% NaBH_4 . The second nonvariant point corresponds to a peritectic reaction $\text{NaBH}_4 \cdot 2\text{H}_2\text{O} \rightleftharpoons \text{NaBH}_4 + \text{solution}$ at $+36.4^\circ\text{C}$ and 45.2 wt% NaBH_4 . The isothermal lines reveal the existence of crystallization fields of three solid phases: $\text{NaOH} \cdot \text{H}_2\text{O}$, NaBH_4 , and $\text{NaBH}_4 \cdot 2\text{H}_2\text{O}$. The last-mentioned field was not observed in the isothermal line for 50° . The dihydrate has a rhombic crystal. It is believed on the strength of the results obtained that anhydrous NaBH_4 can be obtained from aqueous NaOH solutions by

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Solubility Polythermal Line of the NaBH_4 - H_2O System and Solubility Isothermal Lines of the NaBH_4 - NaOH - H_2O System at 0° , 18° , 30° and 50°C

S/078/60/005/011/015/025
B015/B060

re-crystallization, and that a simplification of the refining technique applied so far is thus possible. There are 7 figures, 2 tables, and 16 references: 5 Soviet, 7 US, 2 British, and 1 Austrian.

SUBMITTED: April 27, 1960

Card 3/3

5(2)

AUTHORS: Mikheyeva, V.I., Kost, M.Ye.S/074/60/029/01/003/005
B008/B006

TITLE: Hydrides of Rare-earth Metals

PERIODICAL: Uspekhi khimii, 1960, Vol 29, Nr 1, pp 55-73 (USSR)

ABSTRACT: It is attempted to generalize the existing material on the hydrides of the rare earth metals. A general method for preparing rare earth hydrides is the direct reaction between metal and hydrogen (Refs 5-8). Lately, exchange reactions in nonaqueous and aqueous media have also been applied (Refs 9-17). The synthetic of binary boron¹ and aluminum¹ hydrides of numerous transition metals may be regarded as proof for the existence of their monovalent hydrides (Refs 18-22). The reaction between lanthanum¹ and hydrogen is described in references 23-42. Of the lanthanides, the most easily accessible is cerium. Therefore, the hydrides of the latter were investigated in greatest detail, the chemical and physical properties of the rare-earth metal hydrides being obtained by studying the reaction between them and hydrogen (Refs 5, 23-25, 28, 33, 44-47). Increasing research in this field after 1950 yielded new data. The kinetics of the hydrogenation of cerium¹ are discussed in

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Hydrides of Rare-earth Metals

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B008/B006

references 5,7,27,47,49-51, the composition of cerium hydrides is reported in references 7,8,20,25,27,31,33,49,52, their dissociation pressure in references 5,25,32,47,49, their structure in references 31,35,53-56, their physical and chemical properties in references 7,28,31,49,53,57-59 and 20,23,25,45, 60 respectively. Binary cerium- and aluminum hydrides are discussed in references 18-22. The reaction of other rare earth metals with hydrogen is treated in the following papers: praseodymium[✓] references 28,31,32,35,41,61,62; neodymium[✓] references 24,31,32,61,62; samarium[✓] references 23,24,63-66; europium[✓] references 63,67; gadolinium[✓] references 31,64, 68-70; ytterbium[✓] references 60,63,67. Some special features of rare earth metal hydrides are discussed in references 2,3, 8,20,32,56,58,70-92. The investigation of the composition and properties of these hydrides revealed some of the rare earth metals, which are extremely alike in certain respects, but possess certain individual peculiarities. Thus, e.g., a hexagonal structure is found for samarium- and gadolinium trihydride. Furthermore, certain facts indicate the existence of a Gd_2H_3 -compound. The properties of the europium- and ytterbium hydrides,

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Hydrides of Rare-earth Metals

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which resemble those of the alkali earth elements, vary particularly from the properties of the other rare earth hydrides. It is evident from experimental data that both compounds of constant composition, and phases of variable composition are involved in the equilibrium of the rare earth metal - hydrogen systems. The solid MeH_2 - MeH_3 phases, investigated for cerium and lanthanum, are of particular interest for finding the rules which are followed by the chemical compounds when entering into solution. According to N.S.Kurnakov's theory on berthollides, there exists a changing equilibrium between some valencies of the rare earth metals. Some properties of the rare earth hydrides, as e.g. the thermal stability of the dihydrides, and the change in the type of chemical bond occurring in the MeH_2 - MeH_3 region,

indicate that their application in various fields of metallurgy, in heterogeneous catalytic synthesis, and in the technology of semiconductors will yield positive results. The following Soviet scientists are mentioned: V.I.Mikheyeva, M.Ye.Kost, I.I.Zhukov, and B.V.Nekrasov. There are 7 figures, 8 tables, and 92 references, 20 of which are Soviet.

Card 3/4

*Inst Gen & Inorganic Chem in N S KURNAKOV
AS USSR*

5. 2400(A)

AUTHORS: Mikheyeva, V. I., Fedneva, Ye. M.,
Alpatova, V. I.

68988

S/020/60/131/02/029/071
B011/B005TITLE: Production of Diborane by Reducing Boron Trifluoride Etherate With
Calcium Hydride

PERIODICAL: Doklady Akademii nauk SSSR, 1960, Vol 131, Nr 2, pp 318-320 (USSR)

ABSTRACT: The authors tried to determine the conditions ensuring the reaction mentioned in the title. The present paper is a continuation of previous investigations (Refs 3-5). At first, the said reaction was studied thermographically with N. S. Kurnakov's pyrometer. It was found that the separation of diborane practically coincides with the beginning of boiling of the BF_3 etherate (at 120°). The largest diborane quantity forms at a ratio of $\text{CaH}_2:\text{BF}_3$ - about 3:2 (see equation). Besides the thermal effect which corresponds to this reaction (masked by a superposition of the thermal effect of boiling-out of the etherate), all thermograms (Fig 1) show an endothermic effect at $250-322^\circ$. It corresponds to the decomposition of $\text{Ca}(\text{BF}_4)_2$. An exothermic effect at $300-333^\circ$ is connected with the formation reaction of elementary boron (see equation). The diborane synthesis proceeds at a temperature near the boiling point of the etherate. An apparatus used for this purpose is shown by figure 2. The quanti-

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Production of Diborane by Reducing Boron
Trifluoride Etherate With Calcium Hydride

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B011/B005

tative ratio of the reagents is decisive for the diborane yield (Table 1). In the case of an insufficient quantity of etherate, an exothermic reaction takes place automatically about 1-2 h after the beginning of the diborate separation; this heats the reaction mixture up to 450-500°. The mixture becomes black, and the diborane yield falls. The maximum yield is attained with an etherate excess of up to 60%. In the solid reaction products, CaF_2 , $\text{Ca}(\text{BF}_4)_2$, CaH_2 , and B were proved chemically and roentgenographically (according to Debye). In conclusion the authors state that the method mentioned in the title is suited for a diborane production with good yields. There are 2 figures, 1 table, and 8 references, 4 of which are Soviet.

PRESENTED: November 10, 1959, by I. I. Chernyayev, Academician

SUBMITTED: October 27, 1959

Card 2/2

80089

S/020/60/131/06/13/07
B011/B005

5.2400(A)

AUTHORS: Mikheyeva, V. I., Breyteis, V. B.

TITLE: Isothermal Line of the Solubility of Sodium Boron Hydride and Sodium Hydroxide in Water at 0°

PERIODICAL: Doklady Akademii nauk SSSR, 1960, Vol. 131, No. 6, pp. 1349 - 1350

TEXT: The authors studied for the first time a complete solubility isothermal line of NaBH_4 - NaOH - H_2O at 0°. The joint solubility of NaBH_4 and NaOH in water was investigated under isothermal conditions. The solid phase was analyzed at the same time (according to Ref. 6). Equilibrium was established in 2-3 hours. The phases were separated by filtering. The liquid phase and the solid residue were titrated with 0.1 N HCl and methyl red to determine the total alkalinity. Then followed a titration with 0.1 N NaOH in the presence of mannite and phenolphthalein to determine the boric acid formed by complete hydrolysis of NaBH_4 . The NaBH_4 content was computed from the analytical results for boron the NaOH content from the difference. The diagram mentioned (Fig. 1) shows that from a

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Isothermal Line of the Solubility of Sodium Boron
Hydride and Sodium Hydroxide in Water at 0°

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B011/B005

saturated aqueous solution A (28.9% of NaBH_4) a dihydrate $\text{NaBH}_4 \cdot 2\text{H}_2\text{O}$ crystallizes in proportion to the increasing NaOH content until a composition is attained which corresponds to point B (22.3% of NaBH_4 , 22.5% of NaOH). Further, anhydrous NaBH_4 crystallizes, and - beginning with point C (12.3% of NaBH_4 , 44.4% of NaOH) - the sodium-hydroxide monohydrate. No other solid phases were found. The fact that the solubility of $\text{NaBH}_4 \cdot 2\text{H}_2\text{O}$ decreases successively only at the beginning of its crystallization curve is worth noticing. Later on, its solubility rises noticeably with increasing NaOH concentration. This is possibly connected with the formation of a complex compound between the components which is only stable in the solution. The isothermal line found also suggests a crystallization (at certain NaOH contents) of the anhydrous NaBH_4 . A sufficiently wide range of this crystallization permits the refining of industrial NaBH_4 by recrystallization from aqueous solutions of NaOH. There are 1 figure and 6 references, 2 of which are Soviet.

Inst. Gen. & Inorganic Chem. in N. S. Kurnakov
AS USSR

Card 2/3

S/078/61/006/001/001/019
B017/B054

AUTHORS: Mikheyeva, V. I., Mal'tseva, N. N.

TITLE: Synthesis of Copper Hydride by Reaction of Copper Sulfate With Diborane and Sodium Boron Hydride

PERIODICAL: Zhurnal neorganicheskoy khimii, 1961, Vol. 6, No. 1,
pp. 3 - 8

TEXT: The synthesis of copper hydride by reduction of copper sulfate in aqueous medium by diborane, sodium boron hydride, and phosphorous acid leads to the formation of mixtures of copper hydride and metallic copper. The product of reduction with diborane is more coarsely disperse than that of reduction with sodium boron hydride. Copper hydride was synthesized by Wurtz's method. By chemical, X-ray, and thermographic investigations, the authors established the formation of copper hydride of the composition CuH in the reaction of copper sulfate with phosphorous acid. Some properties of copper hydride, particularly its stability to acids and lyes, were studied. The reducing effect of copper hydride was established by potassium permanganate, potassium iodate, and silver nitrate solutions, from which

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Synthesis of Copper Hydride by Reaction of
Copper Sulfate With Diborane and Sodium
Boron Hydride

S/078/61/006/001/001/019
B017/B054

metallic silver was separated. Reduction of copper sulfate with sodium boron hydride at 0°C leads to the formation of copper hydride. Reaction of copper sulfate with diborane forms a nonuniform reaction product consisting of powdery copper hydride and fine-granular copper. A ratio of Cu : H between 1 : 0.74 and 1 : 0.98 was found. Copper sulfate is best reduced to CuH by phosphorous acid, followed by potassium hypoborate; a yield of up to 70% is obtained with diborane, and a 30% yield with sodium boron hydride. A. I. Astakhov is mentioned. There are 5 figures, 3 tables, and 18 references: 5 Soviet, 1 US, 1 French, 5 German, 1 Italian, 1 Austrian, 1 Swiss, and 3 British. ✓

SUBMITTED: October 1, 1959

Card 2/2

MIKHEYEVA, V.I.; BREYTSIS, V.B.

Solubility isotherms at 0° C in ternary systems NaBH_4 - NaCl -
 H_2O and NaBH_4 - NaBr - H_2O . Dokl. AN SSSR 136 no.5:1093-1095 F
'61. (MIRA 14:5)

1. Institut obshchey i neorganicheskoy khimii im. N.S. Kurnakova AN
SSSR. Predstavleno akad. I.I. Chernyayevy.
(Systems (Chemistry)) (Solubility)

35029
S/020/61/141/001/117/021
B107/B147

5 2200

1043 1087 1273

AUTHORS: Mikheyeva, V. I., and Steriyadkina, Z. K.

TITLE: Hydrogenation of cerium-magnesium alloys

PERIODICAL: Akademiya nauk SSSR Doklady, v. 141, no. 1, 1961, 104-106

TEXT: Ce-Mg alloys were hydrogenated over a wider range of Mg concentrations than had been done by A. Sieverts and E. Roell (Zs. anorg. Chem., 146, 149 (1925)). Ce containing 0.75% of Nd, 0.4% of Pr, 1.0% of La, and 0.04% of Fe, and refined magnesium with a purity of at least 99.9% were used. The authors produced alloys with a Mg content of up to 85 at %, corresponding to $Mg_{1.5}Ce$, in corundum crucibles under LiCl-KCl flux. They hydrogenated at room temperature and a hydrogen pressure of 0.5 - 1 atm in an apparatus described by M. Ye. Kost, ZhNKh, 2, 2689 (1957). They used both cast and heat-treated samples (which absorb H_2 much faster). H_2 is absorbed by the alloys after an induction period which increases considerably with increasing Mg content, but does not change in parallel with the composition. Samples nos. 13 - 15 (Table 1) could only be hydrogenated after activation by previous heating. Alloys with more than 30% of Mg are split by hydrogenation along the cleavage
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10029

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B105/B147

Hydrogenation of cerium-magnesium

planes and can be pulverized to a black powder. Table 1 shows the results. The initial range of the weak effect of Mg on H_2 absorption of Ce is caused by the formation of solid solutions of Mg in Ce. Maximum absorption is reached by alloys having a composition similar to $MgCe$. Peritectic reactions of formation of $MgCe$ from Mg_2Ce reduce H_2 absorption. This applies even

more to alloys richer in Mg which, at room temperature, do not absorb hydrogen either in the initial state or after heat treatment. Up to 10 at% of Mg, Ce-Mg alloys hydrogenated up to saturation behave like CeH_3 . From 10 at% of Mg onward, only vigorous pulverization causes inflammation whereas alloys with 40 and more at% of Mg do not react either with air or with water. In thermal decomposition of the hydrogenation product, H_2 is sep-

arated in several stages. It is noted that $Mg_m H_{2m} Ce_n H_n$ mixtures can be obtained by hydrogenation of Ce-Mg alloys. These mixtures can be expressed by the formula $MgCeH_3$. Both the method of hydrogenation of Ce-Mg alloys and the properties of the "double hydrides" differ from the hydrogenation of Mg and Ce, and from the properties of CeH_3 and MgH_2 respectively. As to their properties, the products of complete hydrogenation of the Mg alloys (see

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B103/B147

Hydrogenation of cerium-magnesium...

MgH_2CeH_3 or $MgCeH_5$) take an intermediate position as compared to their constituents CeH_3 and MgH_2 . There are 1 figure, 1 table, and 6 references: 4 Soviet and 2 non-Soviet. The reference to the English-language publication reads as follows: F. H. Allinger, C. E. Holley et al., J. Am. Chem. Soc., 77, 2647 (1955).

ASSOCIATION: Institut obshchey i neorganicheskoy khimii im. N. S. Kurnakova Akademii nauk USSR (Institute of General and Inorganic Chemistry imeni N. S. Kurnakov of the Academy of Sciences USSR)

PRESENTED: April 29, 1961, by I. I. Chernyayev, Academician

SUBMITTED: April 24, 1961

Table 1. Composition of hydrogenation products of Ce-Mg alloys. Legend: (1) Composition of alloys; (2) hydrogen content; (3) number of test; (4) Mg, at%; (5) Mg, % by weight; (6) induction period, min; (7) time of hydrogenation; (8) per g of hydride, milliliters; (9) per g of Ce, Card 3/4

S/078/62/007/003/003/C
B110/B138

11 2222
11 1240
AUTHORS:

Mikheyeva, V. I., Shkrabkina, M. M.

TITLE:

Potassium - hydrogen interaction

PERIODICAL:

Zhurnal neorganicheskoy khimii, v. 7, no. 3, 1962, 463 - 468

TEXT: Potassium hydride was synthesized from the elements, (1) under static conditions and normal pressure, and (2) from compressed hydrogen by mechanical stirring and the addition of activators. The products which are formed react with water as follows: $KH + H_2O \longrightarrow KOH + H_2$; $K + H_2O \longrightarrow KOH$

+ $0.5 H_2$; $KOH + H_2O \longrightarrow KOH \cdot aq$. If a = weighed portion in g; $V = H_2$

volume under normal conditions in cc; b = KOH in g; x = K content, y = KH content, and z = KOH content, one obtains:

$$x + y + z = a$$

$$\frac{0.5x}{39} + \frac{y}{40} = \frac{V}{22414}$$

$$\frac{56x}{39} + \frac{56y}{40} + z = b$$

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S/078/62/007/003/003/019
B110/B138

Potassium - hydrogen interaction

0.2 - 0.3 g of electrolytic potassium (98.5 % K) was hydrogenated in an iron boat inside a quartz tube heated in a tubular furnace using electrolytic H_2 freed from O_2 at 400 - 500°C over copper filings, and from H_2O by freezing out in liquid N_2 , until the H_2 pressure stopped dropping. KH condensed in the form of white, needle-shaped crystals. H_2 absorption began at 180°C, but only became significant above 300°C. The KH/H ratio grew from 2% at 340°C to 18.1% at 410°C. At 427°C, the KH dissociation tension is equal to atmospheric pressure, the K content grows while the KH content falls, and the hydride turns gray. At 450 - 470°C, the K vapors react with glass. The optimum temperature is 400°C, when the KH content is at least 98%, which corresponds to a hydride yield of 18%. With continuous agitation, interaction takes place throughout the metal mass. According to $\log p_{KH} = -6175/T + 11.69$, the dissociation tension of KH reaches atmospheric pressure at 427°C. Therefore, up to 400°C 3 - 5 atm H_2 pressure are sufficient to suppress the dissociation. This can be done in an autoclave with a sealed agitator. 5 - 10 g of K was put in an autoclave with dry N_2 . H_2 was blown through and the agitator, rotating at 300 - 400 rpm,

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B110/B138

Potassium - hydrogen interaction

was switched on at the melting point of K (68°C). Full hydrogenation was achieved by adding at least 1 % lubricating oil (industrial No. 30) or 0.3 - 0.5 % of the benzene fraction from that oil. 200 - 250°C and 1.5 - 2 hrs are optimum. The resulting dark-gray, almost black powder with ~95% of KH ignites with the least trace of moisture, probably due to the existence of organopotassium intermediates. At 1500 rpm hydrogenation takes place faster, throughout the mass, and without additions, to yield a fine, light gray powder (97 % of KH) which is more resistant to moisture and air. Optimum conditions: 1500 rpm, 250°C , 1-3 atm, and 10 min. The white, needle-shaped crystals formed at 300 - 400°C are produced by interaction of K vapors with hydrogen. The KH yield is higher than NaH, with or without stirring. At 1500 rpm, K is quantitatively hydrogenated in 10 min, Na not before 20 - 25 min, since the formation heats are $\Delta H_{\text{KH}} = -15.16 \text{ kcal/mole}$; ✓

$\Delta H_{\text{NaH}} = -13.60 \text{ kcal/mole}$, the vapour pressures at 440°C are 12 mm Hg for KH and 1 mm Hg for NaH. Due to the greater difference of the thermal expansion coefficient of hydrides and metals ($\alpha_{\text{KH}}^{20-400} = 36 \cdot 10^{-6}$;

$\alpha_{\text{K}}^{0-60} = 83.8 \cdot 10^{-6}$; $\alpha_{\text{NaH}}^{20-400} = 64.0 \cdot 10^{-6}$; $\alpha_{\text{Na}}^{0-90} = 72 \cdot 10^{-6}$), the surface film
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Potassium - hydrogen interaction

5/576/62/007/001/01/019
B110/B138

of potassium is destroyed, and hydrogenation is thus intensified. There are 3 figures, 3 tables, and 18 references: 3 Soviet-bloc and 15 non-Soviet-bloc. The four most recent references to English-language publications read as follows: H. L. Kinsley, Chem. Eng. News, 23, 1332 (1945); A. M. Muckenfuss, US Patent 2073273; W. H. Schechter, U. S. Patent 2929676; March 22, 1960; C. E. Messer et al. J. Amer. Chem. Soc., 77, 4524 (1955). X

SUBMITTED: March 22, 1961

Card 4/4

MIKHEYEVA, V.I.

Development of N.S.Kurnakov's concepts on chemical individuality
in modern inorganic chemistry. Zhur.neorg.khim. 7 no.4:718-721
Ap '62. (MIRA 15:4)

(Chemistry, Inorganic)

S/078/62/007/007/001/013
B179/B101

AUTHORS: Mikheyeva, V. I., Kost, M. Ye.

TITLE: Some properties of lanthanum and neodymium hydrides

ABSTRACT: Zhurnal neorganicheskoy khimii, v. 7, no. 7, 1962, 1493-1498

NOTE: The hydrogenation of La, Nd, and cerium misch metal (~50% Ce, 45% other RE, 5% Fe) and the properties of the hydrides were studied. La and Nd react with H_2 (P_{H_2} ~ 650 mm Hg) even at room temperature. When La, Nd, and misch metal were hydrogenated simultaneously the induction period for misch metal was 5 min and for La 10 min whereas for Nd it was longer than 1.5 hr. La forms a di- and trihydride (LaH_2 and LaH_3), Nd forms a hydride of the composition $NdH_{2.4 \pm 0.1}$ and the composition of the misch metal hydride is LaH_2 . At 100°C the hydrogenation of La was unsuccessful but at 200°C hydrogenation starts without induction period. The rate of hydrogenation of La shows a minimum at 300 - 500°C and a maximum at 700°C. It was LaH_3 that reacted most intensely with H_2O whereas hydrides with Card 1/2

S/078/62/007/001/011
B179/B101

Some properties of lanthanum...

lower hydrogen content hydrolyzed more slowly. Thermal decomposition of all hydrides takes place in two phases. Transition from trihydride to dihydride occurs at 150 - 620°C for misch metal, at 350 - 840°C for La. Dissociation of the dihydride sets in between 950 and 1300°C but is never complete. The density of $NdH_{2.4}$ was found to be 6.06 ± 0.04 . Since the density of NdH_2 is 5.91 ± 0.03 this means that further hydrogenation has the effect of contracting the crystal lattice. There are 8 figures and 3 tables.

SUBMITTED: August 24, 1961

Card 2/2

MIKHEYEVA, V.I.; SELIVOKHINA, M.S.; KRYUKOVA, O.N.

Melting diagram in the system potassium hydroxide - potassium borohydride.
Zhur. Neorg. khim. 7 no.7:1622-1627 J1 '62. (MIRA L6:3)
(Potassium hydroxide) (Potassium borohydride)

S/078/62/007/010/007/008
B144/B186

AUTHORS: Mikheyeva, V. I., Shkrabkina, M. M.

TITLE: Solid solutions in the systems NaOH - NaH and KOH - KH

PERIODICAL: Zhurnal neorganicheskoy khimii, v. 7, no. 10, 1962, 2411-2418.

TEXT: The thermographic and x-ray analyses of the systems NaOH- NaH (NaH maximum 60 %) and KOH- KH (KH maximum 48 %) showed that with rising hydride content the melting point rose, but the temperature of the polymorphic decomposition of hydroxides dropped. The melting diagrams show a peritectic with a limited range of solid solutions. (1) NaOH - NaH: a homogeneous range of solid α -solutions is found at 20°C up to 18 % NaH, and at 200°C up to 30 % NaH. Above 40 % NaH, the structure is heterogeneous, and an endothermic effect at 445°C indicates intense dissociation of NaH. (2) KOH - KH: Solid solutions are formed at 20°C up to 14 % KH, and at $\sqrt{220^\circ\text{C}}$ in systems with up to 30 % KH. With more than 30 % KH, the two-phase melts dissociate intensely at 470°C. It has not been clarified whether and how the components of these systems react with each other; no chemical reaction seems to take place up to 500 - 550°C. The thermal

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B144/B186

Solid solutions in the ...

stability of the solid hydride-hydroxide solutions greatly exceeds that of the pure hydrides; hence the hydrides can be used in this form up to 500 - 550°C. There are 6 figures and 4 tables.

SUBMITTED: February 9, 1962

Card 2/2

34826

S/020/62/142.025, 014.022
B110, B101

11.2222
11.1240

AUTHORS: Mikheyeva, V. I., Selivokhina, M. S., and Kryukova, N. N.

TITLE: Melting diagram of the system potassium hydroxide - potassium boron hydride

PERIODICAL: Akademiya nauk SSSR Doklady, v. 142, no. 1, 1962, pp. 106-107

TEXT: To study the reduction of inorganics by alkali boron hydrides at elevated temperature, the melting diagram of readily fusible inorganics with alkali boron hydrides was investigated. Potassium boron hydride was obtained from: $\text{NaBH}_4 + \text{KOH} \rightarrow \text{KBH}_4 + \text{NaOH}$, eluted with alcohol, and dried in vacuo at 80°C ; it contained 99.5% KBH_4 . The weighed portions of KBH_4 and KOH were filled in N_2 atmosphere into a quartz test glass. The heating and cooling curves were plotted by means of Karnakov pyrometer and Pt-PtRh thermocouple. KBH_4 shows endothermic effects at: (1) melting at 640°C (reversible); (2) decomposition at $690 - 700^\circ\text{C}$; and (3) beginning reaction of the alkali melt with the crucible material at $780 - 800^\circ\text{C}$. KOH shows thermal effects at: (1) polymorphous conversion at 27°C ; (2) Card 1/3

S 020 62 142 008 018 012
B110, B101

Melting diagram of the system

melting at 385°C. In the heating curves, additional irreversible heat effects occur (1) at 100°C, removal of traces of absorbed water, and in the course of an intermediate stage of the establishment of phase equilibrium in the solid and, partly, in the liquid state. Therefore, the cooling curves of mixtures heated to $\leq 690^\circ\text{C}$ were used for plotting the melting diagram. The melting diagram (Fig. 1) for KOH-KBH₄ consists of two branches of crystallization of KOH and KBH₄ intersecting in the system at 347°C and 5.3% KBH₄ concentration. The constant temperature 347°C corresponding to polymorphous KOH conversion in the part of the system rich in KOH proves the absence of solid solutions based on KOH. A slight H₂ separation is observed between 450 and 450°C, the maximum of which corresponds to the equimolar ratio of components. When the melts are dissolved, H₂ is also separated, sometimes with inflammation, particularly in the central part of the system, probably due to: $\text{KBH}_4 + \text{KOH} \rightarrow \text{KBH}_3 + \text{H}_2 + \text{KH}$. The dissociation pressure of KH attains atmospheric pressure at 440°C and the violent reaction with water causes ignition. Thus, the system KOH-KBH₄ is a pseudobinary cross section of a quaternary system. The

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Melting diagram of the system ...

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B110/B101

double melts of the central part have properties and activity of KH at temperatures that lie high above the range of its stability in a pure state. There are 1 figure and 6 references: 4 Soviet and 2 non-Soviet.

ASSOCIATION: Institut obshchey i neorganicheskoy khimii im. N. S. Kurnakova Akademii nauk SSSR (Institute of General and Inorganic Chemistry imeni N. S. Kurnakov of the Academy of Sciences USSR)

PRESENTED: September 11, 1961, by I. I. Chernyayev, Academician

SUBMITTED: September 6, 1961

Fig. 1. Melting diagram for KOH - KBH_4 . Legend: (1) Temperature; (2) % by weight; λ = liquid.

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S/C20/62/143/006/018/024
B106/B138

11 12 40

AUTHORS: Mikheyeva, V. I., and Shkrabkina, M. M.

TITLE: Solid solutions of sodium and potassium hydrides in the hydroxides of these elements

PERIODICAL: Akademiya nauk SSSR. Doklady, v. 143, no. 6, 1962, 1362-1363

TEXT: The solubility of sodium and potassium hydrides in the anhydrous hydroxides of these elements was quantitatively investigated by thermal analysis and the powder method of x-ray phase analysis. Fig. 1 shows the results. The system NaOH - NaH was investigated up to 60% NaH, and the system KOH - KH up to 48% KH by thermal analysis, since the hydrides undergo intense thermal decomposition at higher hydride concentrations. The hydrides and their solid solutions were analyzed by volumetric determination of the hydrogen released on treatment of the specimens with water. Dissociation of the hydrides according to the equation $2 MeH = 2 Me + H_2$ occurs in the binary systems investigated below 600°C, but there is no chemical reaction of the system components according to $MeOH + MeH \rightleftharpoons Me_2O + H_2$.

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PRESENTED: December 13, 1961, by I. I. Chernyayev, Academician

Card 2/3

MIKHEYEVA, V.I.; MAL'TSEVA, N.N.

Infrared absorption spectra of some simple hydrides. Zhur.
strukt.khim. 4 no.5:698-702 S-0 '63. (MIKA 16:11)

1. Institut obshchey i neorganicheskoy khimii imeni N.S.Kurnakova
AN SSSR.

L 11086-63 EPR/EWP(j)/EPF(c)/EPF(n)-2/EWP(q)/EWT(m)/BDS/FCS/T-2/ES(s)-2--
 AEDC/AEFTS/ASD/APUC/RPL/SSD--Ps-l/Pc-l/Pr-l/Pu-l/Pt-l--BW-2/RM/WW/WH/JW/MAY/JWD/
 ACCESSION NR: AP3001616 H/JT S/0030/63/000/005/0034/0039

AUTHOR: Mikheyeva, V. I. (Doctor of chemical sciences)

103

TITLE: New means of inorganic synthesis

SOURCE: AN SSSR. Vestnik, no. 5, 1963, 34-39

TOPIC TAGS: inorganic synthesis, boron, boride, hydride, fluorine compound, peroxide, ozonide, perchloric acid, perchlorate, hydride stabilization, pure boron, pure boride, inorganic polymer

ABSTRACT: Developments in inorganic synthesis associated with the fields of atomic-power engineering, high-altitude aviation, and space flight are reviewed. It is stated that modern engineering requires new, highly heat-resistant materials (boron and borides), inorganic fuels (hydrides and fluorine compounds), heat-resistant plastics (polymeric P and B compounds), and new sources of active oxygen. Among the achievements of Soviet scientists the following are mentioned: 1) stabilization of hydrides for practical use, either in the form of solid solutions in alkali-metal hydroxides or chlorides or in the form of complex hydrides; 2) study of transition metal hydrides of varying composition, such as $TiH_{1.75}$, $VH_{0.9}$ or $CeH_{2.7}$; 3) study of the chemistry of boron and its compounds, including the

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ACCESSION NR: AP3001616

preparation of chemically pure materials and polymers with alternating B and N atoms; 4) synthesis of such oxygen carriers as superoxides and ozonides (NaO_2 , KO_2 , NaO_3 , KO_3), perchloric acid, and perchlorates; and 5) synthesis of inorganic fluorine compounds. In conclusion, new trends in the theory of inorganic synthesis and in research methods are briefly discussed, the need for special equipment is stressed, and the lack of modern equipment at the Academy of Sciences SSSR is noted. Orig. art. has: 3 formulas.

ASSOCIATION: none

SUBMITTED: 00

DATE ACQ: 21Jun63

ENCL: 00

SUB CODE: CH

NO REF SOV: 010

OTHER: 000

mce/157
Card 2/2

MIKHEYEVA, V.I.; SELIVOKHINA, M.S.

Solubility in the systems $\text{KBH}_4 - \text{H}_2\text{O}$ and $\text{KBH}_4 - \text{KOH} - \text{H}_2\text{O}$. Zmur.-
neorg.khim. 8 no.2:439-446 P '63. (MIRA 16:5)
(Potassium borohydride) (Potassium hydroxide)
(Solubility)

L 10658-63

EWI(q)/EWI(m)/BDS--AFFTC/ASD--JD/JXT(IJP)

ACCESSION NR: AP3001211

S/0078/63/008/006/1314/1319

AUTHOR: Mikheyeva, V. I.; Steilyadkina, E. K.; Konstantinova, A. I.; Kryukova, O. N.

TITLE: Absorption of hydrogen by alloys of cerium with magnesium

SOURCE: Zhurnal neorganicheskoy khimii, v. 8, no. 6, 1963, 1314-1319

TOPIC TAGS: absorption; hydrogen; alloys; cerium; magnesium

ABSTRACT: Hydrogen absorption by cerium-magnesium alloys was investigated: alloys having more than 50 at% Mg did not hydrogenate at room temperature; in alloys containing up to 30% Mg, the Ce appears to be preferentially hydrogenated; in the 30-50% Mg range, absorption corresponds to the formula $CeH_{sub 3} \cdot nMgH_{sub 2}$, in particular, $MgH_{sub 2} \cdot 2CeH_{sub 3}$ and $MgH_{sub 2} \cdot CeH_{sub 3}$. Increase in Mg from 0-50% increases the induction period and hydrogenation time. If reaction is carried out at elevated temperature, alloys having up to 66% Mg can be hydrogenated but amount of H absorption is decreased. According to chemical and thermographic examination, the hydrogenation products are mechanical mixtures of the hydrides whose properties are distinct from those of $MgH_{sub 2}$ and $CeH_{sub 3}$ taken separately. Orig. art. has: 4 figures and 2 tables.

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